

**CHARACTERIZATION OF GRANULATED BLAST FURNACE SLAG
FOR PORTLAND CEMENT REPLACEMENT IN CONCRETE**

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SUMMARY

A developmental blast furnace slag ground in the laboratory to nominal finenesses of 4000, 5000, and 6000 cm^2/g has been characterized as a potential Portland cement replacement for concreting and mine backfill applications.

The slags were characterized by a range of techniques including particle size analysis, specific gravity, chemical analysis, scanning electron microscopy-energy dispersive X-ray analysis, and X-ray powder diffractometry. It was found that the slag was highly vitreous (ca. 90%) and could be characterized as a calcium magnesium aluminosilicate glass with melilite as the minor crystalline component. Free MgO was not detected.

Slag activity indices for the three grades were determined as mortars (50:50) by the ASTM C989 method at 7 and 28d and qualified the slags as follows: 4000 and 5000 cm^2/g , "Grade 80"; 6000 cm^2/g , "Grade 100". All the slag-cement mortars had lower early strengths than the control OPC mortar; however, at 28d, both 4000 and 5000 cm^2/g slag-cement mortars exceeded the control. The 6000 cm^2/g slag-cement mortar had an anomalously low 28d strength which should be investigated further in view of possible implications relating to durability.

The hydration of slag-cement pastes (50:50 and 70:30) was investigated at $w/c = 0.5$ and curing ages from 2h to 28d by following: (i) chemical composition of expressed pore fluids, (ii) calcium hydroxide and chemically bound water by thermal analysis (TGA/DTG), (iii) phase composition by XRD, and (iv) microstructural features by SEM-EDXA.

In the early stages of hydration, Ca^{2+} and SO_4^{2-} are present in the pore fluids but, compared to a control OPC paste, they are mobilized at different rates to form insoluble ettringite. At steady

state, the major ions in solution are Na^+ , K^+ , and OH^- with concentrations approximately one-half those in the control. The slag does not appear to contribute significantly to the pore fluid ions at 28d.

Thermal analysis indicates that calcium hydroxide is probably not formed to any significant extent by hydration of the slags; the levels in the slag-cement pastes correspond closely to those expected from the hydration of the Portland cement alone and indicate "pozzolanic" activity is not present at 28d. However, the non-evaporable water contents of the pastes confirm the hydraulic nature of the slags.

Phase and microstructural characterization of the slag-cement pastes indicates that portlandite, Ca(OH)_2 , is present in lower concentration than the control; and that C-S-H and ettringite are the major hydration products, the ettringite morphology showing needles of lower aspect ratio than the control. A magnesium-containing aluminate phase, possibly hydrotalcite, may be among the slag hydration products at later curing ages. Further work to identify the hydration phases involving magnesium is warranted as part of an evaluation of the long term durability of the binder.

The pore structures of the slag-cement pastes were investigated by mercury intrusion porosimetry and their permeability to water at 500 psi. Whilst permeability was not uniquely related to the pore structure parameters, it is clear that the slag-containing pastes have a generally finer distribution of pore sizes than the control OPC paste which relates to their observed impermeability to water at 28d curing.

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1. INTRODUCTION

The present program is part of continuing CANMET investigations of Canadian supplementary cementing materials and was initiated to characterize and evaluate a developmental granulated blast furnace slag (BFS) from a new source as a partial replacement for Portland cement (OPC) in concrete.

The scope of the program was originally specified in Supply and Services Canada Request for Proposal (File No. 03SQ.23440-4-9174) and responded to in ORF Proposal No. 4671-G. Following discussions with the Scientific Authority, a number of modifications to the work statement were made by mutual agreement to meet new priorities and budgetary constraints as summarized in ORF Progress Reports 65-10396-1/2/3. The final scope and objectives of the work are summarized as follows:

- (i) Characterization of blast furnace slag raw materials ground in the laboratory to 4000, 5000, and 6000 cm^2/g as follows: particle size analysis (electrozone method), specific gravity, chemical analysis, morphology by scanning electron microscopy, glass content and mineralogy by optical microscope and X-ray powder diffractometry.
- (ii) Chemical and physical characterization of Portland cement used in study.
- (iii) Determination of 7d and 28d slag activity indices (ASTM C989) for 4000, 5000, and 6000 cm^2/g slags in OPC-BFS (50:50) mortars.
- (iv) Investigation of the hydration behaviour of OPC-BFS (50:50 and 30:70) pastes by following the chemistry of expressed pore fluids and monitoring TGA/DTG-derived Ca(OH)_2 and non-evaporable water contents of the solid phase of pastes at curing ages up to 28 days. Observation of morphological and mineralogical features in the hydrating pastes by SEM-EDXA and XRD.

- (v) Determination of the porosity and permeability (to water) of OPC-BFS (50:50) pastes at curing ages up to 28 days in comparison with an OPC reference paste.

2. EXPERIMENTAL METHODS

2.1 Materials

The developmental blast furnace slag originated from pilot scale granulation trials carried out by Watts Cement Ltd. at the Algoma source. Two materials were supplied by CANMET for the study which, it is understood, had been ground by St. Lawrence Cement to nominal Blaine finenesses of 3400 and 4800 cm^2/g . These materials were reground in the laboratory at ORF by dry ball-milling to provide three grades with nominal finenesses of 4000, 5000 and 6000 (± 10) cm^2/g .*

The cement used throughout the study for the preparation of pastes and mortars was a fresh CSA Type 10 Portland cement supplied by CANMET which originated from Canada Cement LaFarge (Bath plant). The chemical and physical characteristics of the cement are given in Table 1. Chemically, the cement conforms to the requirements of ASTM C989 for total alkali content (i.e. alkalies $<0.9\%$, as Na_2O). As discussed below, this material contained a small quantity of calcium carbonate (ca. 2%) permitted under CSA Standard CAN3-A5-M77.

The water used for the hydration of the pastes and mortars was of deionized laboratory grade which had been boiled to remove carbon dioxide. The pH of the water was typically 6.9-7.1 with the following trace element content: Si, 0.05; Al, <0.02 ; Fe, <0.02 ; Ca, <0.02 ; Mg, <0.02 ; Na, <0.5 ; K, $<0.1 \mu\text{g}.\text{ml}^{-1}$.

* The 3400 cm^2/g material was used to prepare the 4000 cm^2/g laboratory product; the 4800 cm^2/g for the 5000 and 6000 cm^2/g products.

2.2 Characterization of Slags

2.2.1 Particle Size Analysis

The three laboratory ground slags were first reduced to representative fractions for analysis by a rotary riffler technique. Aliquots of each sample were dispersed with a commercial non-ionic dispersant, made up to ca. 20 ml with Isoton II particle-free electrolyte, and then subjected to a low-power ultrasonic bath for 30 sec.

The particle size distribution and statistics for the materials were then determined by the electrozone technique (TA II Coulter counter) using a conventional multi-tube overlap method with 280, 70, and 30 μm tubes (effective particle size analyzing range 0.63 to 128+ μm).

The mean, median and mode particle size statistics by volume for the slags were as follows:

Slag, cm^2/g	Particle Size (μm)		
	Mean	Median	Mode
4000	13.2	15.3	20.4
5000	10.5	11.6	20.1
6000	8.3	8.9	17.7

Cumulative particle size distributions by volume for the 4000, 5000, and 6000 cm^2/g slags are given in Figure 1. Detailed numeric and graphical data are collected in Appendix A.

2.2.2 Specific Gravity

The specific gravities of the slags were determined by the Le Chatelier method using alcohol as the fluid displacement medium and were as follows: 4000 cm²/g, 2.86; 5000 cm²/g, 2.88; 6000 cm²/g, 2.88. All three materials had a specific gravity (true particle density) of 2.92 by air comparison pycnometry (ASTM D2840).

2.2.3 Chemical Analysis

Chemical analysis of the slags, dried at 110°C, for major and minor elements was carried out by inductively coupled argon plasma (ICAP) spectroscopy. Total sulphur was determined by LECO analyzer. The analytical results are given conventionally in terms of the element oxide in Table 2.

2.2.4 Morphology by Scanning Electron Microscopy

Representative samples of each slag grade were attached to the inspection stubs with a graphite-based adhesive and then rendered conductive by gold sputter coating using an ISI PS-2 apparatus. The specimens were then examined using a SEMCO Nanolab 7 scanning electron microscope (SEM) equipped with a Kevex 7000 energy dispersive X-ray analyzer (EDXA). Representative fields at two magnifications for the materials are shown in Figures 2a-c to illustrate the general morphology of the slag grains.

2.2.5 Glass Content and Mineralogy

Optical Method:

The glass content of the 4000 and 6000 cm²/g slags was determined according to the Modified McMaster optical technique (1) using a transmitted light, polarizing microscope with a removable gypsum plate. No magnetic material was apparent on treating the samples with a

hand magnet. By this method, the glass contents of the 4000 and 6000 cm²/g materials were determined to be 95 and 59%, respectively (duplicate determinations).

QXRD Method:

X-ray powder diffraction analysis of the slags was carried out on a Phillips automated diffractometer using monochromatic CuK α radiation (40 kV at 40 mA). Routine scans of the three slags are shown in Figure 3. Aside from the predominantly glassy nature of the materials, as indicated by the broad diffraction maxima extending from 20-40^o2 θ and centred at approximately 32^o θ , the small quantity of crystalline scattering is identified as melilite, a solid solution in the gehlenite-akermanite, C₂AS-C₂MS₂, series.

The glass content in the slags was determined by the ORF-developed quantitative X-ray diffraction (QXRD) method (2) using reference curves for melilite and an internal CaF₂ standard. Measured glass content values for the 4000, 5000 and 6000 cm²/g slags were 89.(5), 90.(9), and 90.(5)%, respectively (triplicate determinations).

2.2.6 Slag Activity Indices

Slag activity indices for the 4000, 5000, and 6000 cm²/g materials were determined at 7 and 28d for OPC-BFS (50:50) mortars according to the procedures specified in ASTM C989-82: Standard Specification for Ground Iron Blast-Furnace Slag for Use in Concrete and Mortars. Corresponding air contents were determined according to ASTM C185. The results are collected in Table 3 and 4.

2.3 Analysis of Hydration Products of Portland Cement-Slag Pastes

2.3.1 Pore Fluid Expression and Analysis

A series of OPC-BFS pastes was prepared at a water: binder (i.e. OPC + BFS) ratio of 0.5 at OPC replacement levels of 50 and 70% w/w for

each of the 4000, 5000, and 6000 cm²/g slags. A control paste with 100% OPC was prepared for reference purposes. Exposure to air was controlled during the preparation and handling of the pastes to minimize carbonation effects. All pastes were sealed in plastic moulds (ca. 2.5 cm diam. x 5 cm) and cured at 21(±1)°C until time of test.

At curing ages of 2h, 5h, 1d, 3d, 7d and 28d the pore fluid was expressed from the pastes using a high pressure technique based on earlier work by Longuet (3) and Diamond (4). A nitrogen blanket was maintained in the apparatus during the expression and manipulation to prevent carbonation of the highly alkaline fluids. As a further precaution, all manipulations involving the pore fluids were carried out in apparatus made of plastic to avoid contamination by SiO₂ which is leached from glassware at high pH. The resultant fluid was immediately diluted to standard volume and analyzed: for Si, Fe, Ca, Al, Na, and K by DC plasma spectrophotometry; for SO₄²⁻ by ion chromatography; and pH by titration with standard HCl to the methyl red end point.

The results of the pore fluid analysis are given in an uncorrected form for the pastes with 50% and 70% slag in Tables 5 and 6, respectively. Corrected data which have been normalized to the initial volume of water are given in Tables 7 and 8, using TGA-derived bound water contents (see Section 2.3.2) following the general approach of Diamond (5).

2.3.2 Thermal Analysis of Pastes

Immediately following the expression of pore fluids, samples for thermal analysis were recovered from the solid paste residues and ground in dry acetone (2 cycles) to arrest further hydration. This was followed by drying to constant weight at 60°C in dry nitrogen, a procedure which has been shown to closely simulate d-drying conditions (6). After drying, all storage and sample manipulation was carried out in a dry CO₂-free nitrogen atmosphere.

Thermal analysis (TGA/DTG) of the prepared specimens was conducted on a Dupont 957 Thermogravimetric System operating under the following conditions:

Atmosphere : N_2 gas	Sample weight : 29-49 mg
Flow rate : 100 cc/min.	Range dy: 1.0 mV
Program rate: $10^{\circ}C/min.$	Y: 0.5 mV/cm
Suppression : 22-47 mg	Temp. range : Ambient- $1000^{\circ}C$

The experimental thermal curves for the prepared OPC-BFS pastes are given in raw form in Appendix B. Following the general data reduction method reported previously (6), a background correction factor was first determined from the thermal curve of unhydrated OPC. This factor was then used in an ORF-designed computer program to generate corrected and normalized calcium hydroxide and non-evaporable water contents (Tables 9 and 10). For comparison purposes, the data are expressed in terms of grams per 100 g OPC and grams per 100 g total binder (i.e. OPC+BFS) for both 50 and 70% replacement levels (see 9).

2.3.3 X-Ray Diffraction Analysis of Pastes

Although outside the scope of the final program, limited qualitative XRD analysis was carried out to assist in the identification of hydration products present in the OPC-BFS pastes. For this purpose an OPC-BFS (50:50) paste was prepared with the $6000\text{ cm}^2/\text{g}$ slag at $w/c = 0.5$. After curing ages of 1d, 3d, 7d and 28d and drying by the technique described in Section 2.3.2, specimens of the pastes were ground and examined by XRD. Major phases identified in the XRD traces are shown in Figure 4.

2.3.4 Scanning Electron Microscopy of Pastes

The development of paste microstructure and hydration products was monitored by SEM-EDXA on the following specimens prepared as described above at curing ages of 5h and 7d: Control, 100% OPC; 50% $4000\text{ cm}^2/\text{g}$ OPC-BFS; 50% $6000\text{ cm}^2/\text{g}$ OPC-BFS.

Sample preparation to arrest hydration was carried out by a modification of the freeze-drying technique described by Orr (7). A small fragment (ca. 0.5 cm^3) fractured from the paste was carefully placed in a bath of dry pentane cooled to ca. -125°C . After 2-3 min. in the bath the specimen was carefully removed with tweezers and placed in a vacuum freeze-drying apparatus to remove all free water. After ca. 10h the specimens were removed and fractured to expose a fresh surface which was mounted and gold-coated for SEM examination.

Representative scanning electron micrographs of the hydrating pastes are shown in Figures 5-7. Selected area chemical micro-analysis (EDXA) was used to assist in the identification of microstructural features.

2.4 Permeability and Porosity of Portland Cement-Slag Pastes

2.4.1 Permeability

A further series of OPC-BFS (50:50) pastes was prepared with the 4000 and 6000 cm^2/g slags at $w/c = 0.5$. A control paste with 100% OPC was prepared for reference purposes. The pastes were cast into straight-sided 50 mm o.d. plastic containers which were placed on a low power vibrating table for ca. 2 min. to remove trapped air. The containers were then sealed and the specimens allowed to hydrate at $21(\pm 1)^\circ\text{C}$; after 24 h the specimens were demoulded and allowed to continue curing in saturated $\text{Ca}(\text{OH})_2$ solution until time of test at 1d, 3d, 7d and 28d.

Immediately prior to testing, a disc of approximately 1 cm thickness was cut from the centre of the cylindrical specimens using a wet diamond saw. The discs were then wet-polished on both sides to 240 grit to remove surface irregularities and inspected by optical microscope for integrity.

After accurate measurement of thickness and diameter, the permeability of the specimens to water was determined at 21°C in an ORF-designed cell operating at 500 psi (8). After an equilibration period of between 2-5 h the flow rate through the specimen was determined by either collecting and weighing effluent (early 1d, 3d ages) or monitoring column movement by travelling microscope of the effluent in a calibrated capillary tube (late 7d, 28d ages) with open end maintained at 100% humidity to minimize evaporation losses. Permeability data for the pastes are collected in Table 11.

2.4.2 Porosity

Duplicate samples of the OPC-BFS pastes described in section 2.4.1 were analyzed by mercury intrusion porosimetry using a Micromeritics AutoPore 9200 instrument. A small portion of each sample (ca. 0.5-1.0 g) was selected such that all surfaces were free of the mould wall impression. Each sample was outgassed under vacuum (10h) and then subjected to mercury intrusion from 1.0 psia to 60,000 psia, corresponding to a pore diameter range of 190 μm to 0.003 μm .

The porosimetry-derived output data for pore area, pore diameter, bulk density, skeletal density and porosity for the pastes are summarized in Table 11. Differential pore-size distribution plots (i.e. dv/dp vs. size) for the pastes are given in Figure 8. Corresponding cumulative pore-size distribution curves for the 28d pastes are given in Figure 9. Detailed raw porosimetry data are collected in Appendix C.

3. RESULTS AND DISCUSSION

3.1 Slag Characteristics

The electrozone particle size analysis data (Figure 1) are consistent with the Blaine specific surfaces of the slags in showing trends to progressively finer distribution of particle sizes which parallel increasing specific surface. In addition to the particle size

statistics given in Section 2.2.1, it is interesting to note that the percentage by volume of ultrafine particles less than 5 μm in the 6000 cm^2/g slag is twice that in the 4000 cm^2/g material: i.e. 4000 cm^2/g , 15.1; 5000 cm^2/g , 23.8; 6000 cm^2/g , 31.8% v/v. This is likely to be an important observation in assessing the relative chemical reactivity of the slags since the ultrafine particles have high surface area and contribute a large part of the activity of the materials, particularly in the early stages of hydration.

The general uniformity of the three slag grades is confirmed by the similarities of specific gravity (range 2.86-2.88) as well as by the results of the chemical analysis (Table 2). It would appear, therefore, that the primary grinding process conducted before the materials reached ORF did not introduce any marked segregation of phases (e.g. concentration or depletion of crystalline components).

Chemically (Table 2), it is interesting to note that the magnesium content of the slags is very high (ca. 18.5%) and comparable with levels reported for South African slags (9). Calculated hydraulic indices* incorporating the magnesium are approximately 1.6 and are well in excess of the >1.0 requirement of CSA A363-M1977.

Mineralogically (Figure 3), the slags are predominantly glassy with melilite identified as the minor crystalline phase. In the absence of other observable crystalline phases, it must be concluded that the magnesium is distributed between the melilite and the glass, rather than being present in a more liberated form such as periclase, MgO . This interpretation is consistent with the location of the slag composition in the idealized $\text{CaO-SiO}_2\text{-MgO}$ ternary system (at 10% Al_2O_3) in the melilite phase field (Figure 10). In this way, it is useful to consider the new slag as a calcium magnesium aluminosilicate glass in which the magnesium is a glass modifying element with a similar function to calcium. In this respect, it has been reported that the Mg^{2+} ion in a glassy slag is present in the four-fold coordination state (10).

* i.e. $\text{CaO}+\text{MgO}+\text{Al}_2\text{O}_3/\text{SiO}_2$

There is some disparity in the measured glass contents of the slags as determined by the optical and QXRD methods. As noted above, XRD indicates that the slags are predominantly glassy. This was confirmed by the QXRD method using an internal CaF_2 reference and melilite calibration curves (2), from which a melilite content close to 10% w/w was determined for all three slags. With no other discernible phases, by difference, this places the glass content of the materials close to 90% w/w. By comparison the CSA A363 optical method yields widely divergent glass contents of 95% and 59% for 4000 and 6000 cm^2/g slags, respectively, which must be considered suspect. As specified, the CSA A363 method calls for an initial sample preparation to isolate particles in the size range 45-63 μm for subsequent examination by optical microscope. For the fine slags under investigation, very few particles conform to this size requirement at the coarse end of the particle size distribution (see Figure 1). This is particularly true for the 6000 cm^2/g slag (mean particle size 8.3 μm), and strongly suggests that the low glass content of 59% arises because particles which are not representative of the bulk material are being examined. It is not unreasonable to suggest that more crystallinity might be found in the larger grains due to the greater hardness and resistance to grinding in the ball mill. It would appear, therefore, that the optical method has limitations for quantifying glass content in finely ground slags and is more appropriate for examining coarser materials up to 4000 cm^2/g .

A preliminary indication of the strength gain of OPC-BFS (50:50) mortars is shown by comparison with a reference OPC mortar in Table 3. After 7d curing, all the slag mortars had strengths below the reference; of the OPC-BFS mortars the greatest strength development was observed for the 6000 cm^2/g material (83% of reference) in keeping with greater reactivity being associated with finer grain size and higher surface area. After 28d curing, however, the OPC-BFS mortars showed a departure from this trend: both 4000 and 5000 cm^2/g slags exceeded the strength of the reference (101 and 110%, respectively) but, unexpectedly, the 6000 cm^2/g material exhibited less strength gain and fell below the reference (90%). The air contents of the slag mortars (Table 4) are slightly less than the control mortar and decrease with increasing slag fineness.

According to ASTM C989-82 definitions, the 6000 cm²/g slag would qualify as "Grade 100", although it is marginal at 28d. The 4000 and 5000 cm²/g slags would qualify as "Grade 80" on the basis of their low 7d strengths; however, their 28d strengths are equivalent to "Grade 100" and "Grade 120(marginal)", respectively. Further investigation of the strength gain characteristics of the slag-containing mortars is clearly needed to confirm the anomolous behaviour of the 6000 cm²/g material and to establish whether a long term durability problem might exist (see later discussion).

3.2 Portland Cement-Slag Hydration

3.2.1 Pore Fluid Chemistry

The dominant ions present in the pore fluids expressed from both the OPC and OPC-BFS pastes are Ca²⁺, Na⁺, K⁺, SO₄²⁻ and OH⁻; the concentrations of Si, Fe and Al are very low and close to experimental detection limits (Tables 5 and 6).^{*} Variations in the concentrations of the dominant ions in solution for all pastes are compared graphically in Figure 11 as a function of curing age. Similar plots for the data normalized to the initial volume of water are shown in Figure 12.⁹ Trends in these data are noted as follows:

Calcium: Calcium levels in the pore fluids are low but there are marked differences between the control and the OPC-BFS pastes. The control reaches a maximum Ca²⁺ level of 4 mmol/L (0.004M) at 3d, dropping slightly to ca. 3 mmol/L at 28d. By comparison, the OPC-BFS pastes exhibit an early Ca²⁺ concentration spike at 2-5h, this being most noticeable at 70% slag replacement, particularly for the 4000 cm²/g slag where a Ca²⁺ level of 10 mmol/L (0.01M) was observed at 2h; the early spike is less pronounced as the fineness of the slag increases. The 28d Ca²⁺ levels for the OPC-BFS pastes are similar to the control; however, these pastes have lower Ca²⁺ levels than the control at 3d. These observations are likely associated with differences in the rate of ettringite, C₃A₃H₃₂, formation in the pastes, which are

^{*} Analysis of OPC-BFS (50:50) pastes with the 6000 cm²/g slag also indicated that Mg is present in the pore fluid in only trace concentration (close to the detection limits).

controlled by the rate of calcium release by the Portland cement and slag. It is thought likely that the 2h Ca^{2+} spike is not observed in the OPC control due to a greater rate of reaction and that analysis of pore fluids at an earlier age (e.g. less than 1h) would reveal a similar effect. The apparent fall off in Ca^{2+} levels at 2-5h with increasing slag fineness is consistent with calcium release being the dominant factor: a greater rate of calcium release would be expected from the finer, higher surface area slag.

Sulphate: Sulphate, originating from the gypsum set regulator added to the OPC, is present in significant concentrations in solution at early ages but is rapidly removed from the system by the formation of highly insoluble ettringite. In general, the sulphate levels are in accordance with a simple dilution of the sulphate available from the OPC by slag; thus, while the control shows a maximum sulphate levels of 75 mmol/L at 5h, the OPC-BFS (50:50) pastes exhibit levels of ca. 35 mmol/L. There appears to be some difference in the rate of sulphate removal from solution, the slag pastes showing much lower relative sulphate levels at 1d compared to the control. This is likely related to the higher calcium levels in the slag systems noted above. In the OPC-BFS pastes, there is a small but noticeable increase in the solution sulphate at longer curing age which is most marked for the 6000 cm^2/g slag (3, 7 and 28d concentrations are 0.6, 1.1, and 7.1 mmol/L, respectively). To some extent this correlates with a small increase in the Ca^{2+} levels in the mature OPC-BFS paste fluids. Whether this signifies the potential for further (and possibly disruptive) ettringite formation requires further investigation.

Sodium and Potassium: Both sodium and potassium show monotonic increases in concentration in the control paste reaching ca. 250 mmol/L (0.25M) at 28d (Figure 11). However, when normalized to the initial volume of water (Figure 12), it is evident that Na^+ reaches steady state after 3d, while K^+ is essentially at its final level after only 2h. These observations indicate: (i) that Na^+ and K^+ are not actively involved in the gel formation reactions; and (ii) K^+ is associated with OPC phases (such as C_3A) which hydrate faster than those rich in Na^+ . In general, the

Na^+ and K^+ levels in the OPC-BFS pastes conform to the same trends as the control (at reduced levels), suggesting that these ions are not released significantly by the hydrating slag. There is some indication, however, that Na^+ and K^+ are removed from solution at 28d, this being most marked for the finer grade of slag.

Hydroxyl and pH: Even at 2h curing, the pore fluids are substantially alkaline with $\text{pH} > 13$ ($\text{OH}^- > 100 \text{ mmol/L}$). The control exhibits a monotonic increase in OH^- concentration with curing age to ca. 500 mmol/L (0.5M) at 28d (Figure 11). Normalized data (Figure 12) indicate that pseudo-steady state is reached at ca. 3d. By comparison, the OH^- level in the OPC-BFS pastes is somewhat lower, reaching ca. 290 mmol/L (50% slag) and ca. 200 mmol/L (70% slag), in approximate accordance with OPC replacement factors. All the slag systems show a small decrease in OH^- (corresponding to the Na^+ and K^+ depletion) at the longer curing ages, although this does not appear to be related to slag fineness.

Ionic Balance: A useful cross-check of the analytical data comes from the cation:anion ionic ratio which should have a value of 1.00 if all contributing ions in solution have been accounted for and determined correctly. It is evident (Tables 5 and 6) that the ionic balance is generally good for analyses of pore fluids from pastes cured beyond 1d; however, deviations from balance are found for the 2 and 5h pastes where, analytically, the anions exceed the cations. Interestingly, the deviations are more pronounced for the OPC-BFS (30:70) pastes, suggesting that the analytical problem might be associated more with the slag.

In summary, it can be seen that the pore fluids expressed from mature control and OPC-BFS pastes conform closely to, and are best described as, solutions of sodium and potassium hydroxides. In the immature pastes (i.e. <1d curing), significant levels of sulphate are present in the pore fluids, with sodium and potassium cations rather than calcium. Steady state concentrations of calcium and silicon in the pore fluid are very low, i.e. approximately 0.003M and 0.0003M, respectively.

The pore fluid from the OPC-BFS (50:50) pastes has approximately one-half the OH^- concentration of the control OPC paste but in terms of the conventional pH scale (i.e. 13.4 vs. 13.7, respectively) the difference is not so obvious.

As pointed out by Diamond (5), the concentrations of ions expressed from pastes are controlled by three mechanisms: (i) dissolution of ions from reacting cement, cement additives (e.g. gypsum), or slag; (ii) removal of ions from pore solution by incorporation into solid reaction products; and (iii) concentration by virtue of water uptake from pore fluid by hydration of cement or slag. For the slag-cement system under study, it is clear that the slag modifies the cement pore fluid chemistry, largely to alter the rate of calcium and sulphate entry and departure. There appears to be no significant introduction of sodium and potassium from the slag itself; like OH^- , these ions appear at reduced levels in the OPC-BFS pore fluids in approximate accordance with the cement replacement level (i.e. similar to a "filler" effect).

Further investigation of the system is urgently needed, in particular to identify the nature of the hydration products resulting from the sulphur (sulphide) present in the slag. This could give rise to a wide range of sulphur-bearing anionic species (e.g. S_n^{2-} , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, etc.) depending on redox conditions, and could account for the poor ionic balance in the immature pastes when "sulphate" is high. In this respect, Glasser (11) has identified polysulphides in pore solutions from British slag-cements.

3.2.2 Calcium Hydroxide and Non-Evaporable Water Content of Pastes

The variation in the TGA/DTG-derived calcium hydroxide and non-evaporable water contents of the OPC and OPC-BFS pastes with curing age are shown graphically in Figures 13 and 14.

The $\text{Ca}(\text{OH})_2$ contents of the pastes generally reflect the replacement level of OPC with slag; thus, the (50:50) and (30:70) OPC-BFS pastes have $\text{Ca}(\text{OH})_2$ contents which are ca. 55% and 37% of the control, respectively, at 28d, with no observable dependence on slag fineness. It would appear from these data that the hydration of the slags does not significantly supplement the $\text{Ca}(\text{OH})_2$ produced by the hydration of the OPC. This is shown more clearly in Tables 9 and 10 where it can be seen that the $\text{Ca}(\text{OH})_2$ contents of the OPC-BFS pastes (expressed in g/100g OPC) are similar to the control beyond 1d curing. The data also indicate there is some inhibition of early $\text{Ca}(\text{OH})_2$ production in the slag cement systems up to 1d.

By comparison, the non-evaporable water contents clearly demonstrate the hydraulic nature of the slags. This is shown clearly for the OPC-BFS (50:50) pastes which bind approximately 80% of the water consumed by the control OPC paste; with no slag hydraulic activity, a value close to 50% of the control would be expected. For the OPC-BFS (30:70) pastes at 28d, it is evident that total hydration is slightly less advanced than the OPC-BFS (50:50) systems with approximately 72% of the control OPC water bound. However, on the basis of simple mass proportions of OPC to slag, it would appear that the slag binds slightly more water at the higher (30:70) replacement level.

From the preceeding data, it is apparent that, compared to the OPC control, the OPC-BFS pastes bind proportionally more water than they liberate $\text{Ca}(\text{OH})_2$. Whether the slags are net consumers of $\text{Ca}(\text{OH})_2$ is not clear from the present short-term data; it is possible that, in the short term, production and consumption of $\text{Ca}(\text{OH})_2$ occur at nearly equal rates so that, experimentally, no change is observed. This aspect of the hydration mechanism requires further attention.

3.2.3 Phase Identification and Microstructure of Pastes

The principal phases identified by XRD in the hydration of the OPC-BFS system (50:50) prepared with the 6000 cm^2/g slag are shown in

Figure 4. The hydration of the OPC component is shown clearly by the decline of the C_3S and C_2S maxima as $Ca(OH)_2$ and C-S-H gel form. There is some decrease in the intensity of the broad glassy diffraction maxima of the slag with curing age but the effect is not marked and indicates that, even at 28d, slag hydration is not very advanced. Ettringite is observable at 1d and persists to 28d curing with no apparent conversion to monosulphate. The broad line (Phase "X") centred at $11.4^\circ 2\theta$ (7.8Å) has not been positively identified but it is seen to increase in intensity with age. This feature is tentatively assigned to hydrotalcite, $Mg_6Al_2CO_3(OH)_{16} \cdot 4H_2O$, (I_{max} , 7.69Å), which has been reported (12) in the hydration products of slag cements with a significant magnesium content, such as those under study.* An alternative but less likely assignment of this feature is to the carbonated calcium aluminate phase, $Ca_4Al_2CO_3(OH)_{12} \cdot 6H_2O$ (I_{max} , 7.6Å).

While the thermal analysis was carried out principally to quantify $Ca(OH)_2$ and non-evaporable water in the pastes, closer inspection shows there are some differences in detail between the control and OPC-BFS pastes (Figure 15). First, the reduced intensity of the DTG peak at ca. $475^\circ C$ in the slag-containing pastes relative to the control is attributable to the lower calcium hydroxide content. Second, the broad low temperature peak centred at ca. $100^\circ C$, which is assigned to C-S-H decomposition, has resolved in it several other peaks which are possibly associated with ettringite or other loosely bound hydrates. Finally, the DTG peak at ca. $375^\circ C$ is more intense in the slag cements and shifted to slightly higher temperature (i.e. ca. $400^\circ C$ relative to the control). In the control, this feature is associated with aluminate hydrate decomposition; however, it is noted that magnesium hydroxide, decomposes close to $400^\circ C$ so that this feature in the slag cements might arise from decomposition of the related hydrotalcite phase referred to above. In view of the concern over the fate of magnesium during the hydration of the new slag cement, it is clear that further investigation of the phase chemistry of the system is warranted. In particular, if the $400^\circ C$ peak

* Other workers have also proposed the formation of magnesium aluminate species, M_4AH_x , in the hydration products of high-Mg slag cements (13).

can be confirmed to be derived from a magnesium-containing phase such as hydrotalcite, TGA/DTG will provide a unique method for quantifying the progress of slag hydration.

The general morphology of fracture surfaces of the control and slag-cement pastes at 5h and 7d are shown in the accompanying scanning electron micrographs (Figure 5-7). Morphologically, the 5h pastes are very similar in showing the onset of hydration. In the control (Figure 5a), the cement grains are coated with a fine layer of amorphous-looking C-S-H and ettringite; unreacted gypsum crystals are still observable. Both 4000 and 6000 cm²/g slag-cement systems show similar early growth of C-S-H gel on cement and slag grains (Figure 6a and 7a); again, gypsum is still evident but ettringite growth does not appear to be as advanced as the control and was not positively confirmed by EDXA.

After 7d curing, there are more pronounced differences between the control and slag-containing pastes. In the control (Figure 5b), extensive deposits of angular crystalline portlandite, Ca(OH)₂, are present together with a more developed growth of fibrillar C-S-H gel (types I and II); where it is distinguishable from the fibrillar C-S-H, the ettringite appears as delicate needles with high aspect ratio. In the slag-containing pastes (Figures 6b and 7b), and in accordance with the thermal analysis results (section 3.2.2), the deposits of portlandite, Ca(OH)₂, are less abundant than the control; fibrillar C-S-H shows extensive development on both cement and slag grains, adopting a range of morphologies with a predominance of the type II C-S-H. There is some indication in the fields examined, that the ettringite needles in both 4000 and 6000 cm²/g slag-cement pastes are more abundant and have a lower aspect ratio (i.e. shorter and thicker) than the control. At 7d, there are no obvious differences in morphology between the two slag-cement pastes which might be attributed to the different finenesses, both showing hydration products with good pore filling qualities which are comparable to, or slightly exceed, the control.

No direct evidence of magnesium-containing phases was obtained by SEM-EDXA microanalysis in the 7d samples examined. In this respect, it

is likely that any magnesium aluminate reaction products, such as hydrotalcite, might be localized on the surface of the slag grains and, therefore, possible obscured from view by SEM by C-S-H gel growth. In support of this view, Tanaka et al (14) have observed magnesium enrichment of inner hydrate layers in hydrated slag grains, suggesting that magnesium migration away from the host site is not favoured. Further investigation of the present slag-cement at longer curing ages to investigate the magnesium transfer from the slag is clearly in order.

3.2.4 Pore Structure: Permeability and Porosity

The coefficient of permeability (K) to water of the OPC and OPC-BFS (50:50) pastes was calculated from the experimental flow rates assuming the applicability (15) of Darcy's equation:

$$\frac{dQ}{dt} = KA \frac{\Delta h}{L}$$

Where, $\frac{dQ}{dt}$ = rate of flow of water (m^3/sec)

A = cross-sectional area of sample (m^2)

Δh = drop in hydraulic head (pressure difference) across the sample

L = length of path through sample, or thickness (m)

All the pastes (Table 11) showed a progressive decrease in their permeability to water with curing age. At 1d, the permeability of the 6000 cm^2/g slag-cement paste was approximately one-half that of the control and the 4000 cm^2/g slag-cement paste. At 7d, the 6000 cm^2/g slag-cement paste and the control had similar permeabilities (ca. 3.5×10^{-6} Darcy) which were considerably lower than the 4000 cm^2/g slag-cement paste (3.8×10^{-5} Darcy). However, at 28d, both slag-cement pastes had no measurable flow (permeability $< 10^{-9}$ Darcy) compared to the higher permeability (1.0×10^{-7} Darcy) of the control.

A further probe of the pore structure of the pastes comes from the results of the mercury intrusion porosimetry (Table 11). At 28d, the porosities of the control and the 4000 cm²/g slag-cement were similar (33.8 and 31.9%, respectively) and significantly less than the 6000 cm²/g slag-cement (42.0%). A comparable difference in the pastes was seen in the pore area data at 28d: the control and the 4000 cm²/g slag-cement levelled off to 59 and 72 m²/g, respectively; whereas the 6000 cm²/g slag-cement had a surface area of 115 m²/g which appeared to be still increasing at 28d.

Further insight into the porosimetry data is obtained by considering the distribution of pore sizes in the pastes. Following the general approach of Roy and Parker(16), it is useful to examine maxima in the differential pore size distribution plots (Figure 8) as an indication of the "critical pore size" or the "maximum continuous pore size". This maximum represents the grouping of the largest fraction of interconnected pores which, in turn, are related to the transmittivity of the paste (16).

The following comparisons may be made for the pastes cured to different ages: (i) all pastes show a trend to smaller critical pore size (from ca. 1.0 to 0.1 μ m diam.) as curing advances; (ii) similarly, the peak height is reduced with paste maturity, consistent with the reduction in intruded volume; (iii) for each curing age up to 7d, the relative coarseness of the slag-cement pores relative to the control are shown, but at 28d the 6000 cm²/g slag-cement exhibits a finer critical pore size (the control and the 4000 cm²/g slag-cement are similar at this age). Comparisons of intruded volume are made more clearly in cumulative pore size distribution plots, as illustrated for the 28d pastes in Figure 9. Plotted in terms of absolute and relative volume (Figures 9a & b), it is clear that the 6000 cm²/g slag-cement paste has an intrusion profile which is consistent with the presence of finer pores with greater total volume. The control and the 4000 cm²/g slag-cement have similar distributions of relatively coarser pores.

Following the determination of pore structure parameters for the pastes, it is of further interest to relate these back to the experimental permeabilities. The relationships between permeability and the porosimetry data for porosity, pore area, and pore diameter are shown for the pastes in Figures 16-18, respectively. It can be seen that, while permeability is not uniquely related to these parameters, there are definite trends signifying that, as hydration advances, the pore structure changes in a way that generally restricts water flow. This is most obvious in the plot for average pore size (Figure 18), since this parameter is representative of the hydraulic radius: i.e. lower diameters of pores will tend to inhibit the flow of water through the sample. Figure 19 shows that there is reasonable agreement between the structural parameter from hydraulic radius theory (17) and permeability^{*}; however, the best fits for the data come from considering the OPC and OPC-BFS pastes separately (correlation coefficients: OPC, 0.963; 4000 cm²/g OPC-BFS, 0.946; 6000 cm²/g OPC-BFS, 0.950; total data, 0.898), suggesting there are fundamental differences in the water transmittivity of the slag-containing pastes from the control Portland cement paste. These results are generally comparable with those of Nyame(18). The same author has suggested that changes in the viscosity of water in the flow channels may be influenced not only by the size of the pores but also by the surface properties (e.g. charge, etc.) of particles in micro-porous materials.

4. CONCLUSIONS

1. A developmental blast furnace slag, ground to nominal finenesses of 4000, 5000, and 6000 cm²/g, has been characterized by a range of techniques. The slag was highly vitreous (ca. 90%) with a significant

* Permeability, K, is related to porosity (ϵ) and hydraulic radius (R_H) by:

$$\log K = C_1 + C_2 \log(\epsilon R_H^2) \text{ where, } C_1 \text{ and } C_2 \text{ are empirical constants}$$

magnesium content ($\text{MgO} = 18.6\%$) and was identified principally as a calcium magnesium aluminosilicate glass with melilite as the minor crystalline component. Free MgO was not detected. The high glass content // indicates that the granulation trials were successful.

2. Slag activity indices were determined for the three grade finenesses as OPC-BFS mortars (50:50) by the ASTM C989 method at 7 and 28d, and qualified the slags as follows: 4000 and 5000 cm^2/g , "Grade 80"; 6000 cm^2/g , "Grade 100". The 7d strengths were all lower than the control OPC mortar; however, the 28d strengths for the 4000 and 5000 cm^2/g slag-cement mortar exceeded the control. The 6000 cm^2/g slag-cement mortar had an anomalously low 28d strength which should be investigated further in view of possible implications relating to durability.

3. From the analysis of expressed pore fluids, it is evident that the rates of mobilization of Ca^{2+} and SO_4^{2-} in the immature OPC-BFS pastes differ from the OPC paste. This may be associated with ettringite formation. In mature pastes, the major ions in solution are Na^+ , K^+ , and OH^- with concentrations approximately one-half those in the control. The slag itself does not appear to contribute significantly to the pore fluid chemistry at 28d. The effects of slag fineness and OPC replacement level have been discussed.

4. As determined by the thermogravimetric technique, it is evident that calcium hydroxide is not formed to any significant extent by the hydration of the slags up to 28d; the $\text{Ca}(\text{OH})_2$ levels in the OPC-BFS pastes correspond closely to those expected for the OPC alone. However, it is not clear from the present data whether the production and consumption of $\text{Ca}(\text{OH})_2$ occur at similar rates during the early hydration of the slag. It would be of obvious interest to examine pastes cured beyond 28d to probe possible "pozzolanic" activity in the slag. The TGA/DTG-derived non-evaporable water contents confirm the hydraulic nature of the slags.

5. Phase and microstructural characterization of the slag-cement (50:50) pastes at $w/c = 0.5$ indicates that: (i) portlandite, $Ca(OH)_2$, is present in lower concentration than the control; (ii) type II C-S-H and ettringite are major hydration products with good space-filling characteristics; (iii) ettringite has lower aspect ratio than the control; and (iv) that a magnesium-containing aluminate, possibly a hydrotalcite, may be among the hydration products of the slag. Additional characterization of the hydration phases is required to develop a clearer view of the slag hydration mechanism.

6. The physical structure of the pore system in the OPC-BFS (50:50) pastes at $w/c = 0.5$ has been investigated by mercury intrusion porosimetry and the determination of permeability to water. Whilst it was found that permeability was not uniquely related to the pore structure parameters, it was evident that the slag-cement pastes have a generally finer distribution of pore sizes than the control OPC paste which relates to their observed impermeability to water at 28d.

5. RECOMMENDATIONS

The following recommendations are made with respect to further research on the slag-cement binders with a view to potential concrete applications:

1. That further research be carried out to determine the mechanism for the hydration of the new slag-cement binder; in particular, to confirm the fate of the magnesium from reaction of the slag. This work should be developed to include an investigation of the hydration of the slag-cement under different curing regimes: for example, other w/c ratios, other cements (e.g. high and low alkali), alternative curing temperatures, and curing media.

2. Further data are urgently needed to develop a better understanding of the pore structure of the slag-containing pastes, particularly as it relates to the permeability to water and durability to other fluids (e.g. ground waters rich in sulphate and saline/sea waters rich in Mg and Cl; see recommendation 4). This should include an investigation of the pore structure of the pastes cured under the different conditions cited in recommendation 1.

3. That the strength gain characteristics of OPC-BFS mortars prepared with 4000, 5000 and 6000 cm^2/g slags be determined to extended curing periods (e.g. 90d) to evaluate the anomalous 28d performance of the 6000 cm^2/g slag-cement mortar in the ASTM C989 slag activity test. It is recommended that this be carried out in conjunction with an investigation of the expansion (normal and accelerated) of the mortars as a probe of possible deleterious (expansive) reactivity in the binder. It would be of further value to investigate the mortar-making characteristics of the binder at varying w/c ratios and curing temperatures.

4. That the durability of slag-containing mortars and concretes be investigated with respect to: sulphate attack; saline/sea water exposure; freezing and thawing.

5. As the program develops, further attention should be given to the properties of slag-containing concretes as they relate to: (a) the performance of chemical admixtures, (b) alkali-aggregate reactivity, and (c) the corrosion rate of steel in reinforced slag concrete.

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FIGURES - -

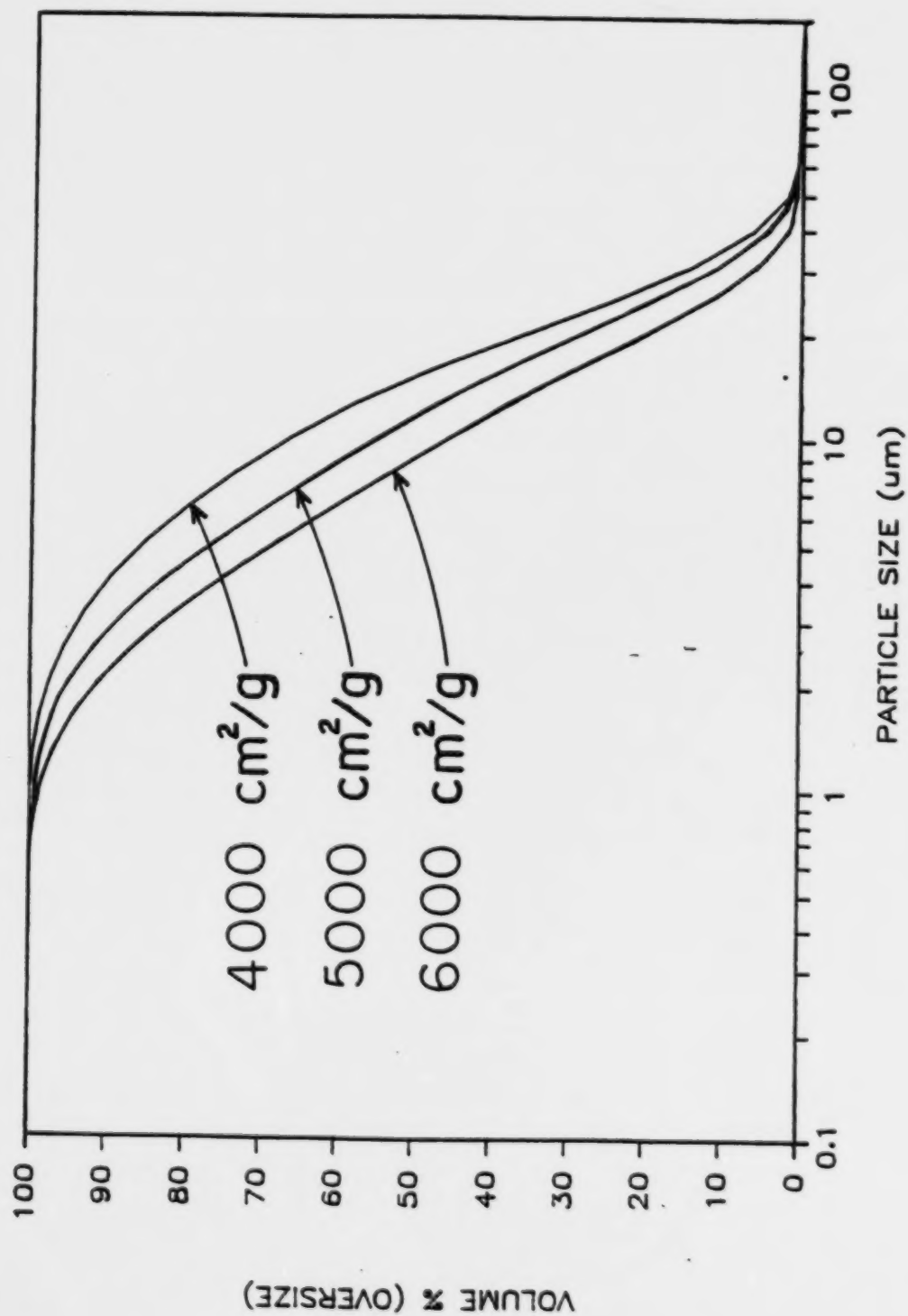


FIGURE 1. Particle Size Distributions (Coulter) of 4000, 5000 and 6000 cm²/g Slags.

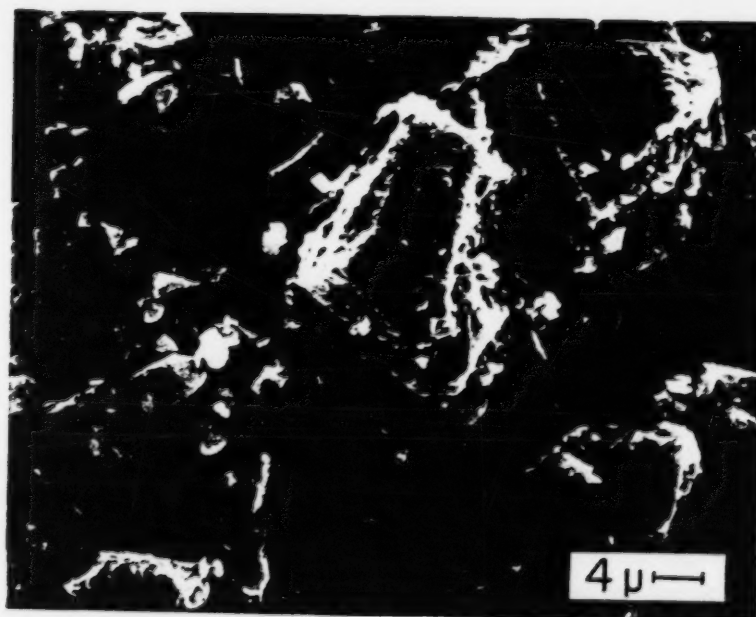
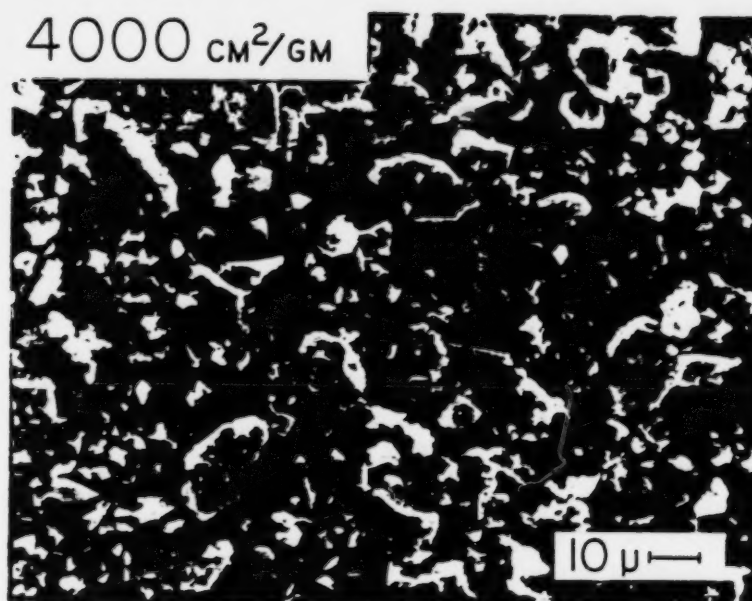


FIGURE 2a. Scanning Electron Micrographs of 4000 cm^2/g Slag.

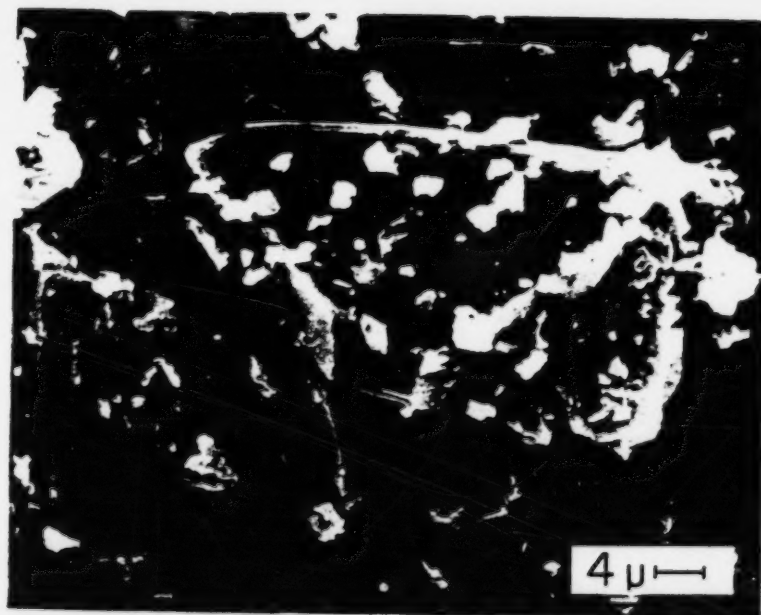
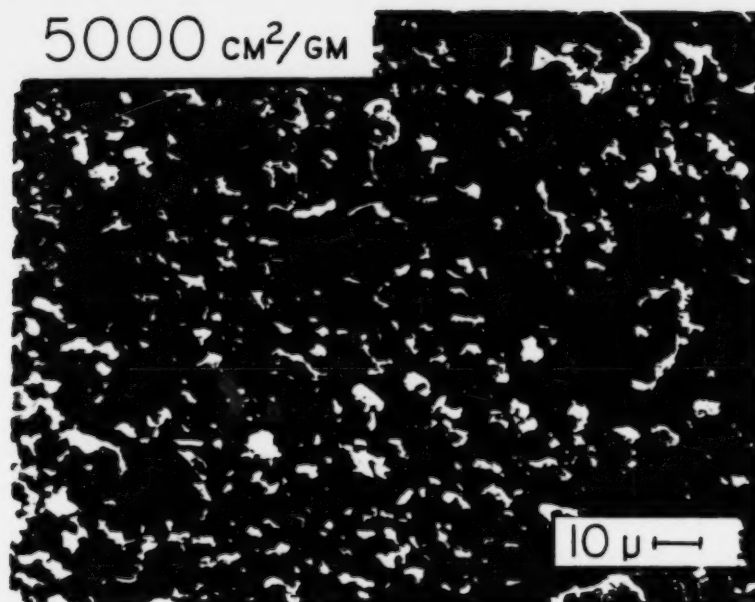


FIGURE 2b. Scanning Electron Micrographs of 5000 cm^2/g Slag.

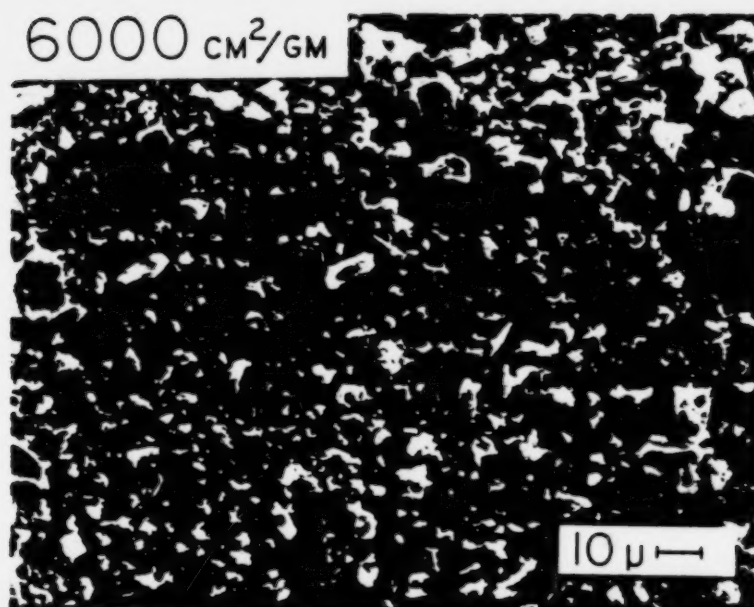


FIGURE 2c. Scanning Electron Micrographs of 6000 cm^2/g Slag.

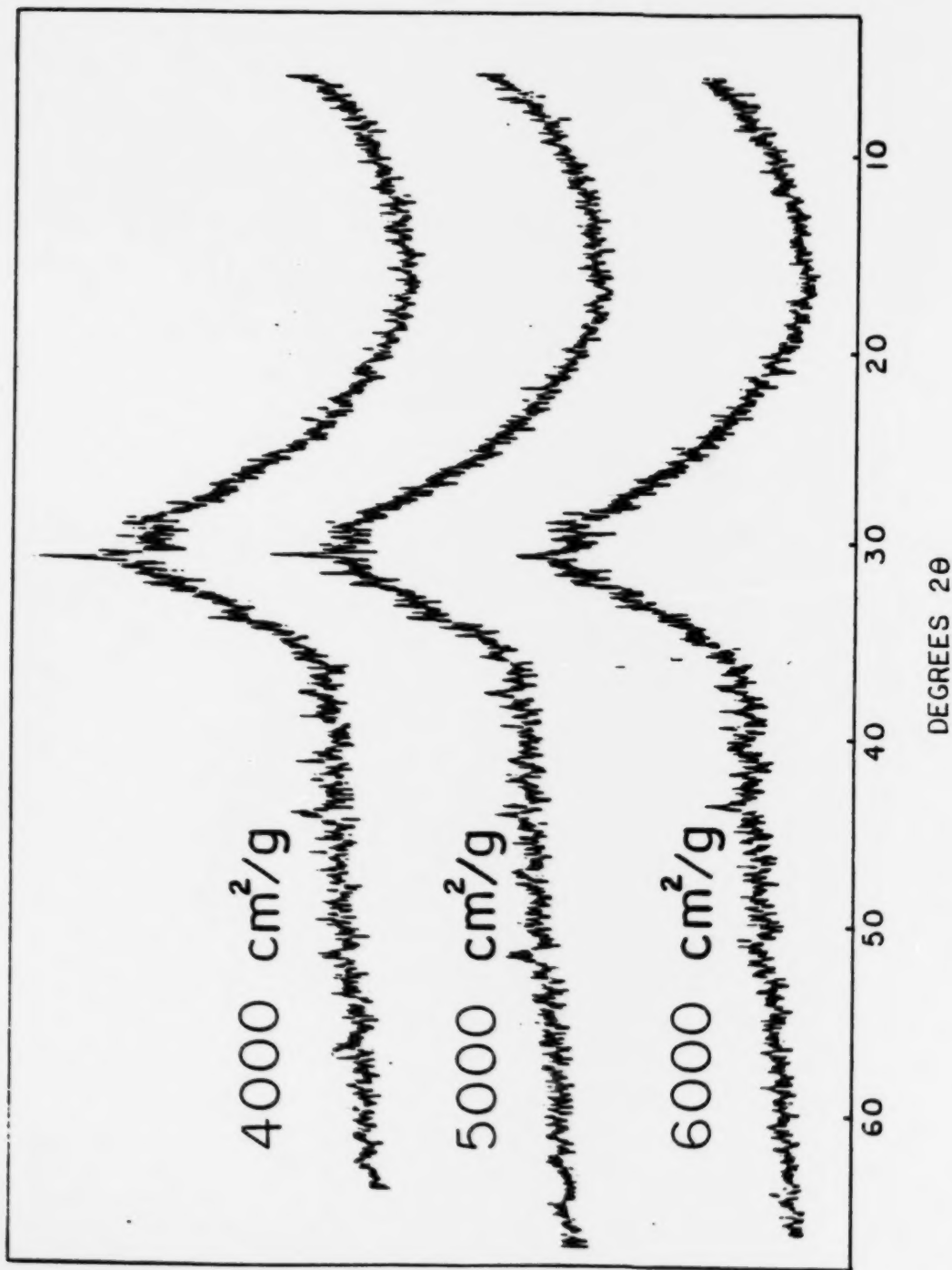


FIGURE 3. XRD Traces (CuK_α) for Slags.

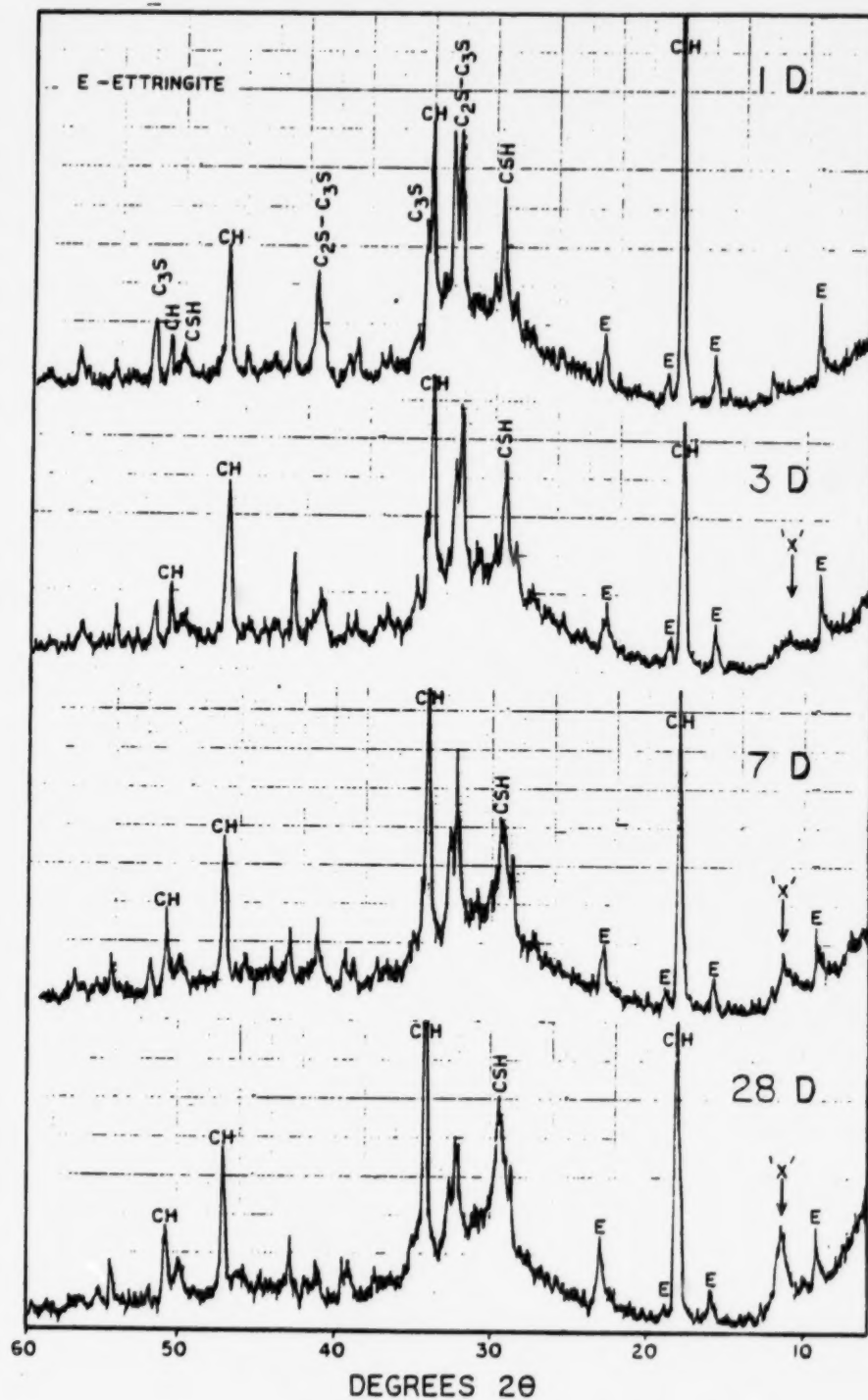


FIGURE 4. XRD Traces showing identification of principal phases in OPC-BFS pastes (50:50) prepared with 6000 cm²/g slag. Phase "x" is tentatively assigned as Hydrotalcite (see text).



FIGURE 5a. Scanning electron micrographs of control OPC paste at 5h ($w/c = 0.5$):

- a. early stage C-S-H growth
- b. ettringite(?)
- c. calcium hydroxide
- d. gypsum needle



FIGURE 5b. Scanning electron micrographs of OPC control paste at 7d ($w/c = 0.5$):

- a. fibrillar C-S-H (type II?)
- b. ettringite (high aspect ratio)
- c. calcium hydroxide
- d. pore space



FIGURE 6a. Scanning electron micrographs of
4000 cm²/g slag cement paste at 5h
(w/c = 0.5):

- a. early growth of C-S-H and ettringite(?)
- b. slag grain, unhydrated
- c. gypsum

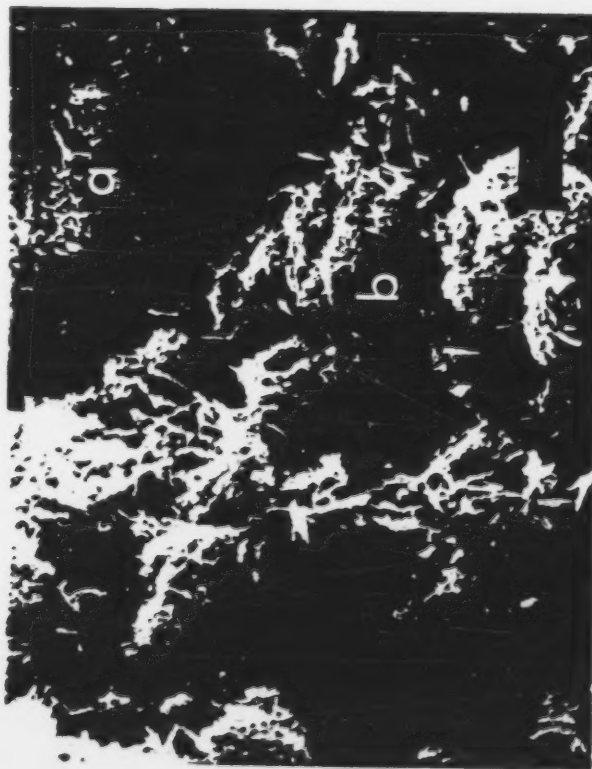


FIGURE 6b. Scanning electron micrographs of 4000 cm^2/g slag-cement paste at 7d ($w/c = 0.5$):

- a. C-S-II (type II)
- b. ettringite (low aspect ratio)
- c. calcium hydroxide
- d. unreacted surface of slag grain

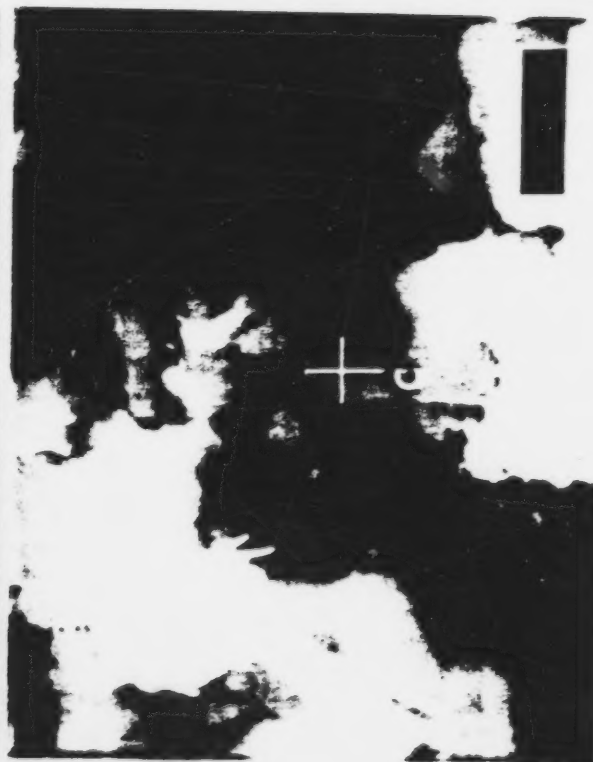
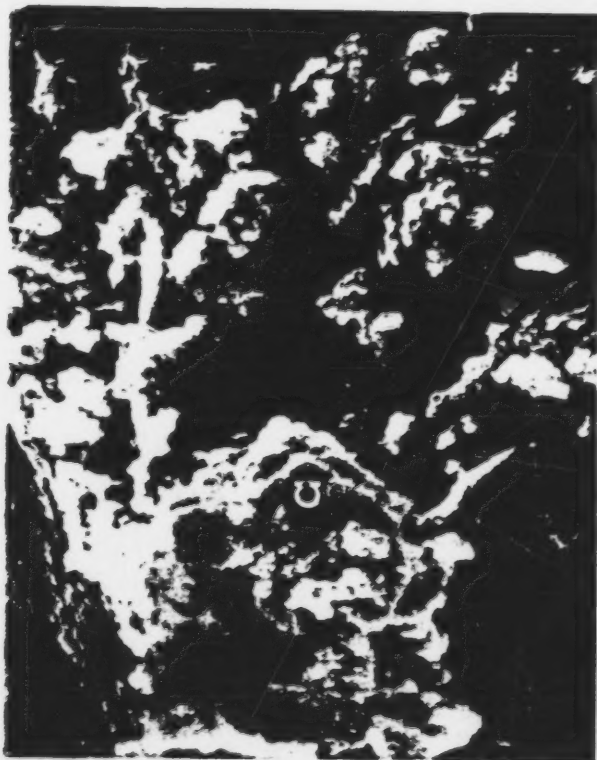


FIGURE 7a. Scanning electron micrographs of 6000 cm²/g slag-cement paste at 5h (w/c = 0.5):

- a. early stage C-S-H growth
- b. slag grain with possible early stage ettringite coating
- c. gypsum



FIGURE 7b. Scanning Electron micrographs of 6000 cm²/g slag-cement pastes at 7d (w/c = 0.5):

- a. C-S-H (type II)
- b. ettringite on slag grain
- c. calcium hydroxide
- d. pore space
- e. C-S-H? (Al and S present)

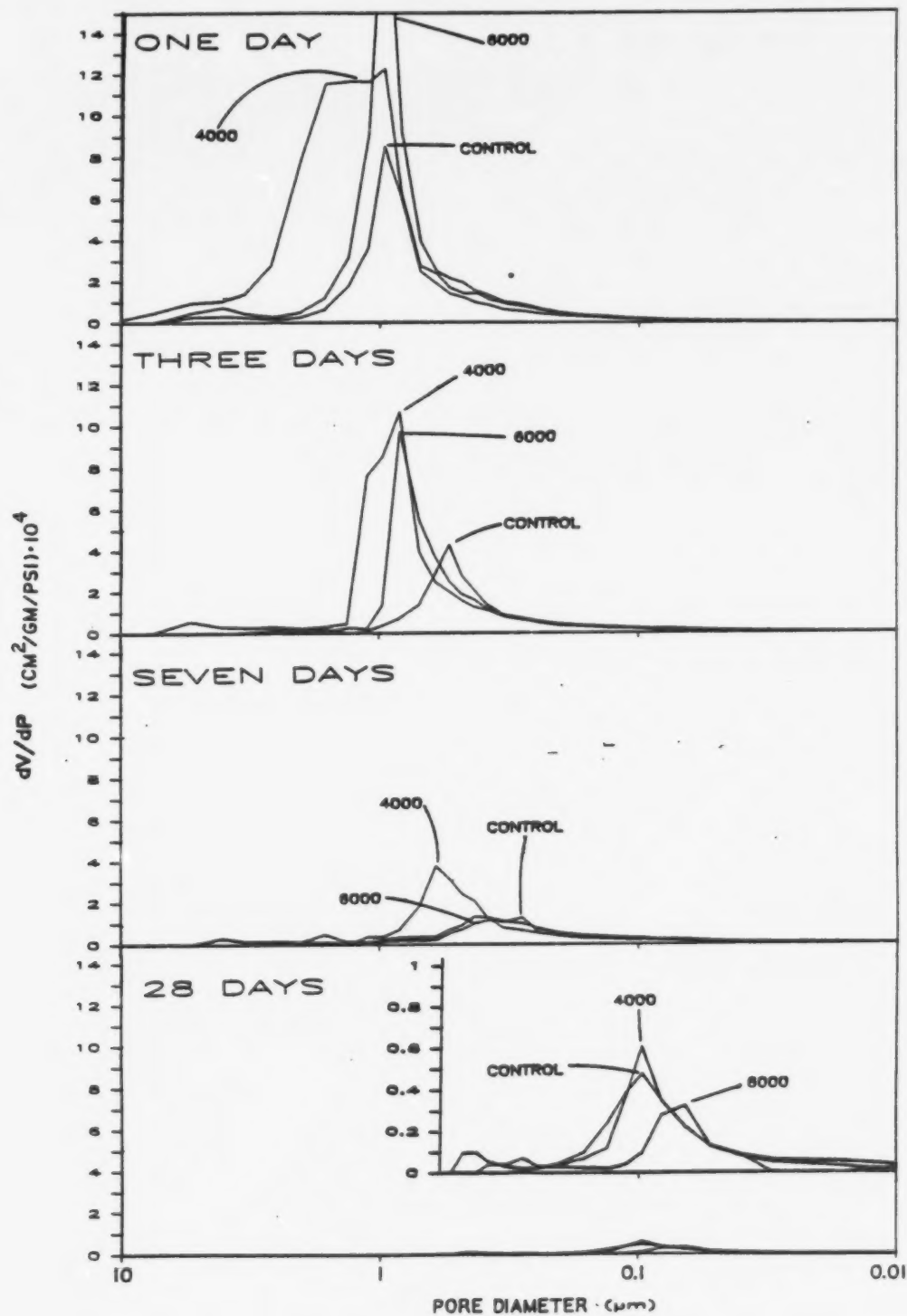


FIGURE 8. Variation of dV/dp with pore diameter for OPC and OPC-BFS (50:50) pastes at various curing ages. Inset at 28d has vertical axis $\times 10$.

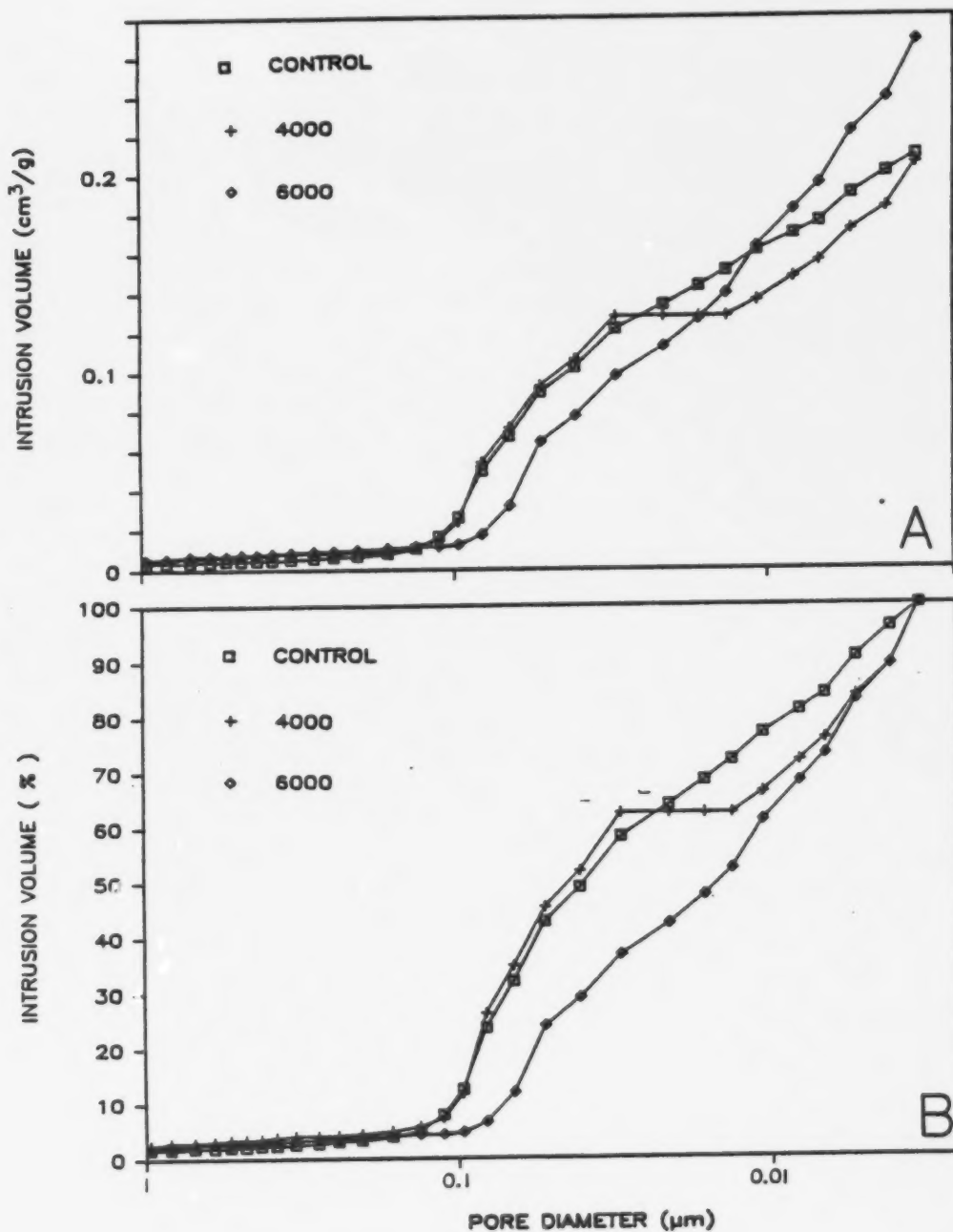


FIGURE 9. Cumulative Pore Volume vs. pore diameter for 28d OPC and OPC-BFS (50:50) pastes: (A) plotted as absolute intrusion volume; and (B) plotted as relative intrusion volume (100% = total intrusion volume per paste)

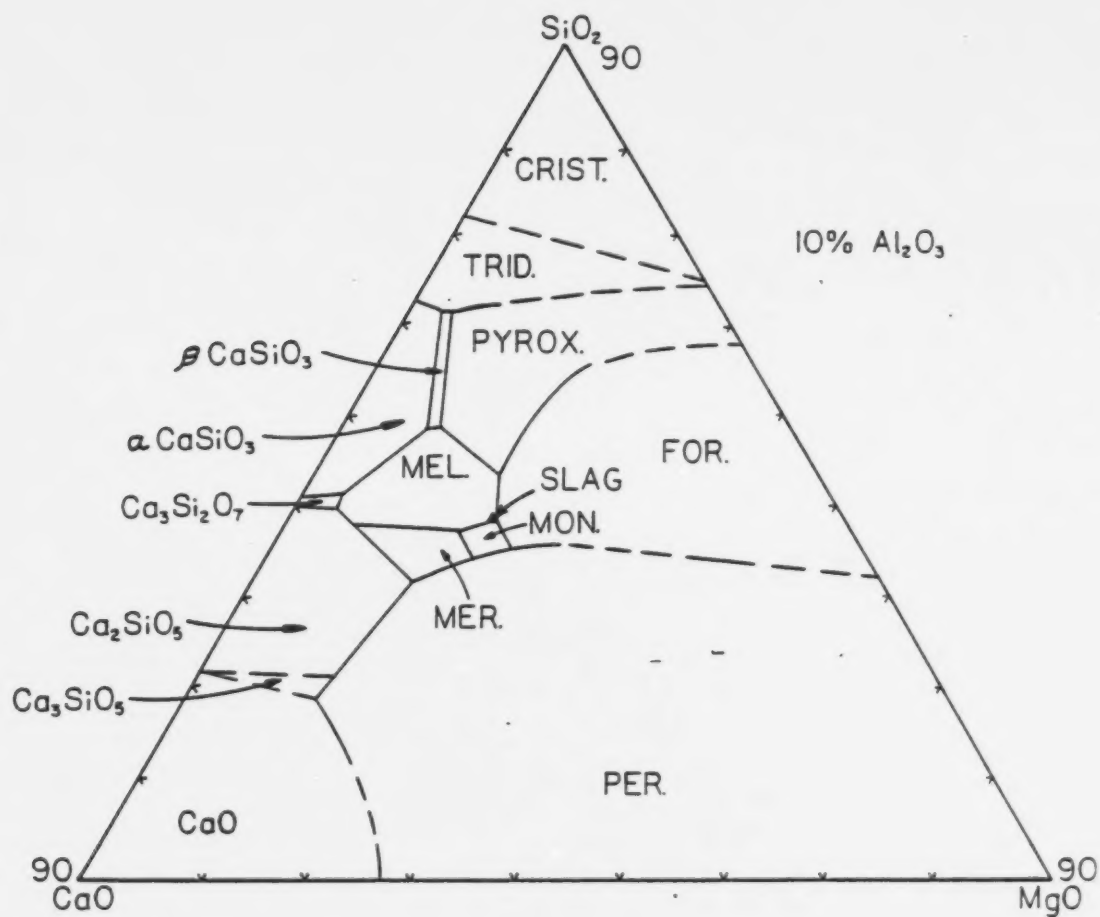


FIGURE 10. Location of Slag Composition
in idealized CaO-SiO₂-MgO
phase system
(10% Al₂O₃)

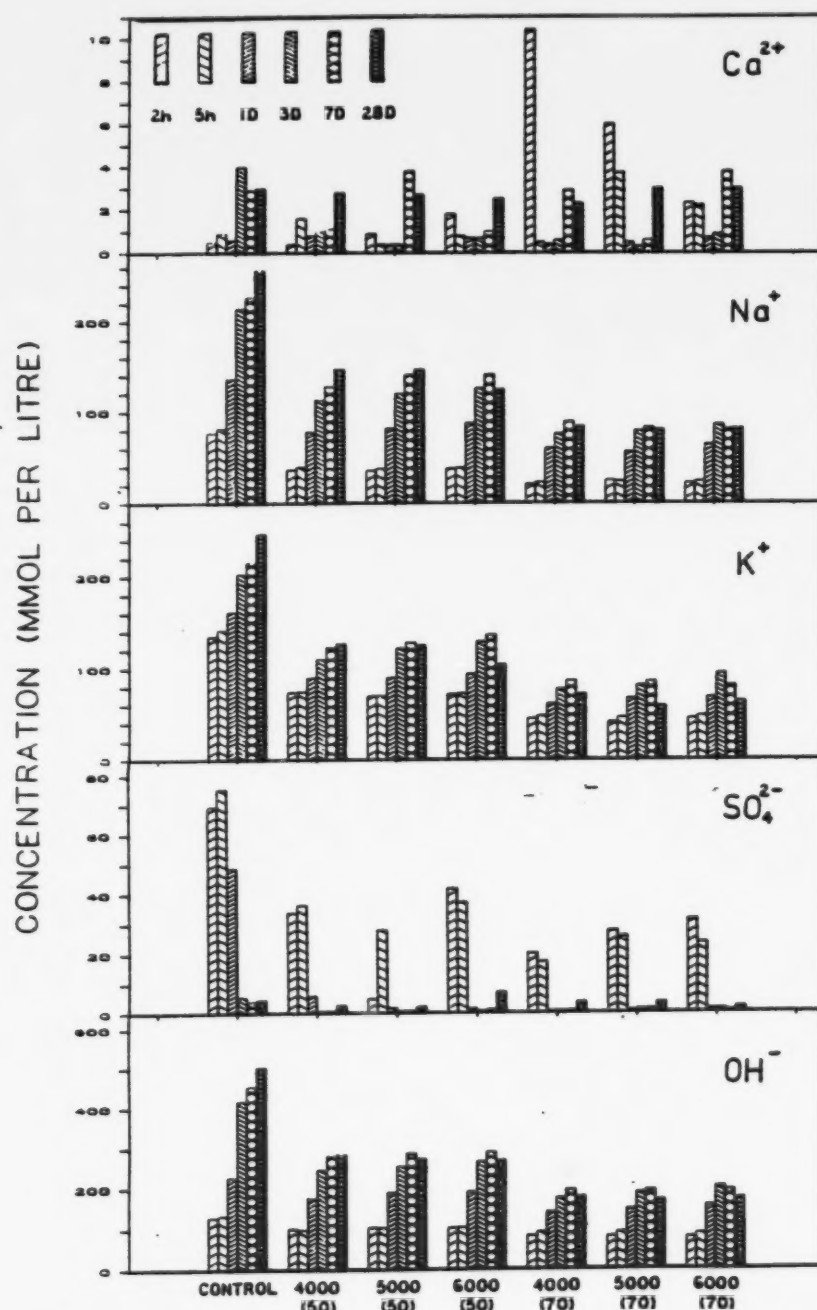


FIGURE 11. Variation in Concentration of Principal Pore Fluid Ions Expressed from OPC-BFS Pastes (50:50 and 30:70) at Curing Ages up to 28 Days (Uncorrected).

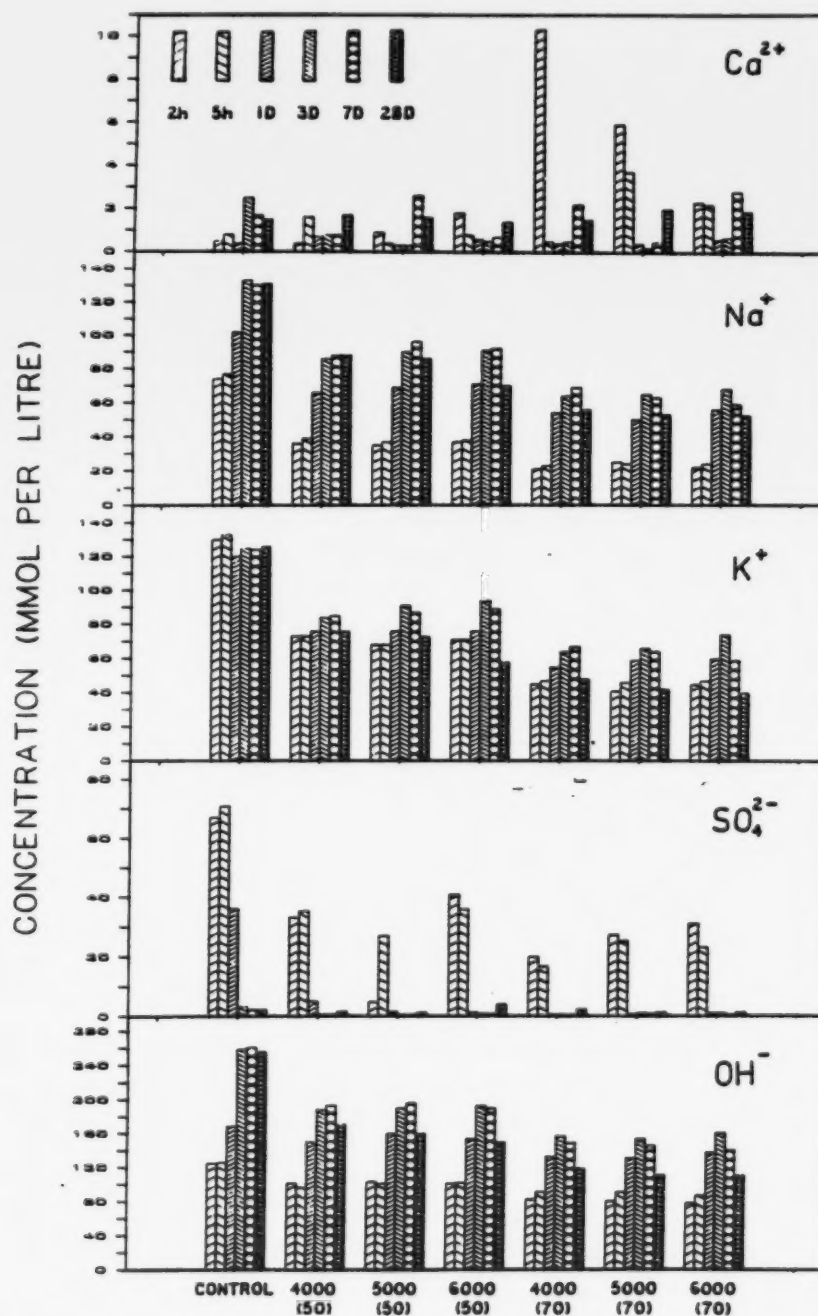


FIGURE 12. Variation in Concentration of Principle Pore Fluid Ions Expressed from OPC-BFS pastes (50:50 and 30:70) at Curing Ages up to 28 Days (Data Normalized to Initial H_2O volume).

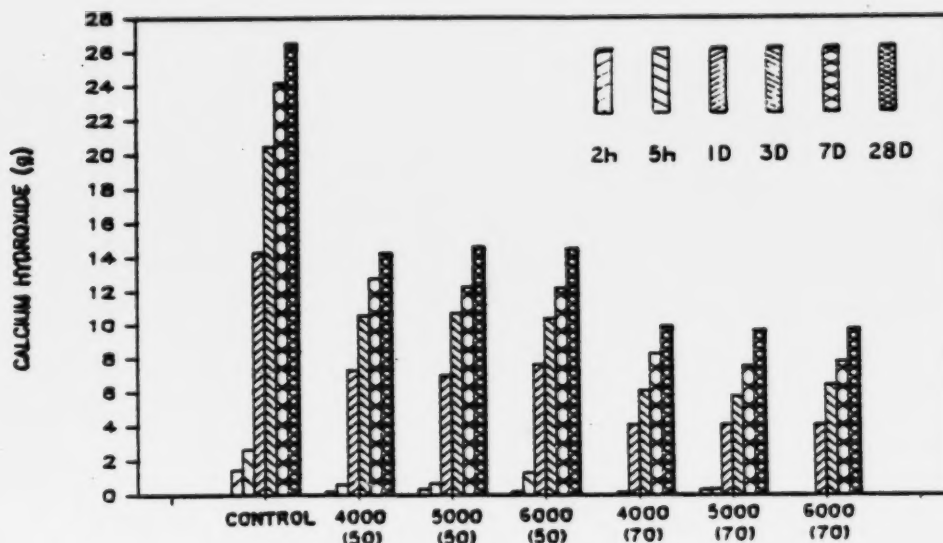


FIGURE 13. Calcium hydroxide content (g/100 gm total binder) of Portland Cement-Slag pastes.

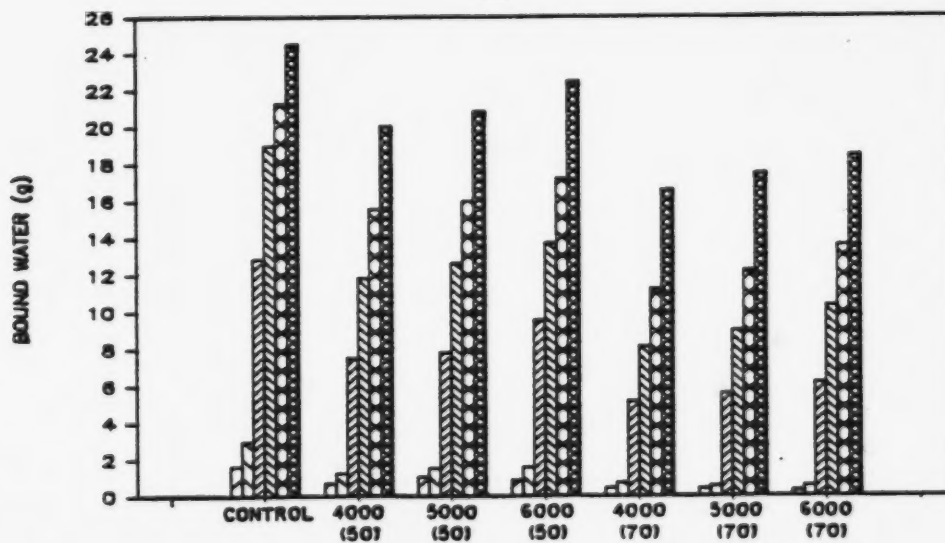


FIGURE 14. Non-evaporable water content (g/100 gm total binder) of Portland Cement-Slag pastes (see legend Figure 13).

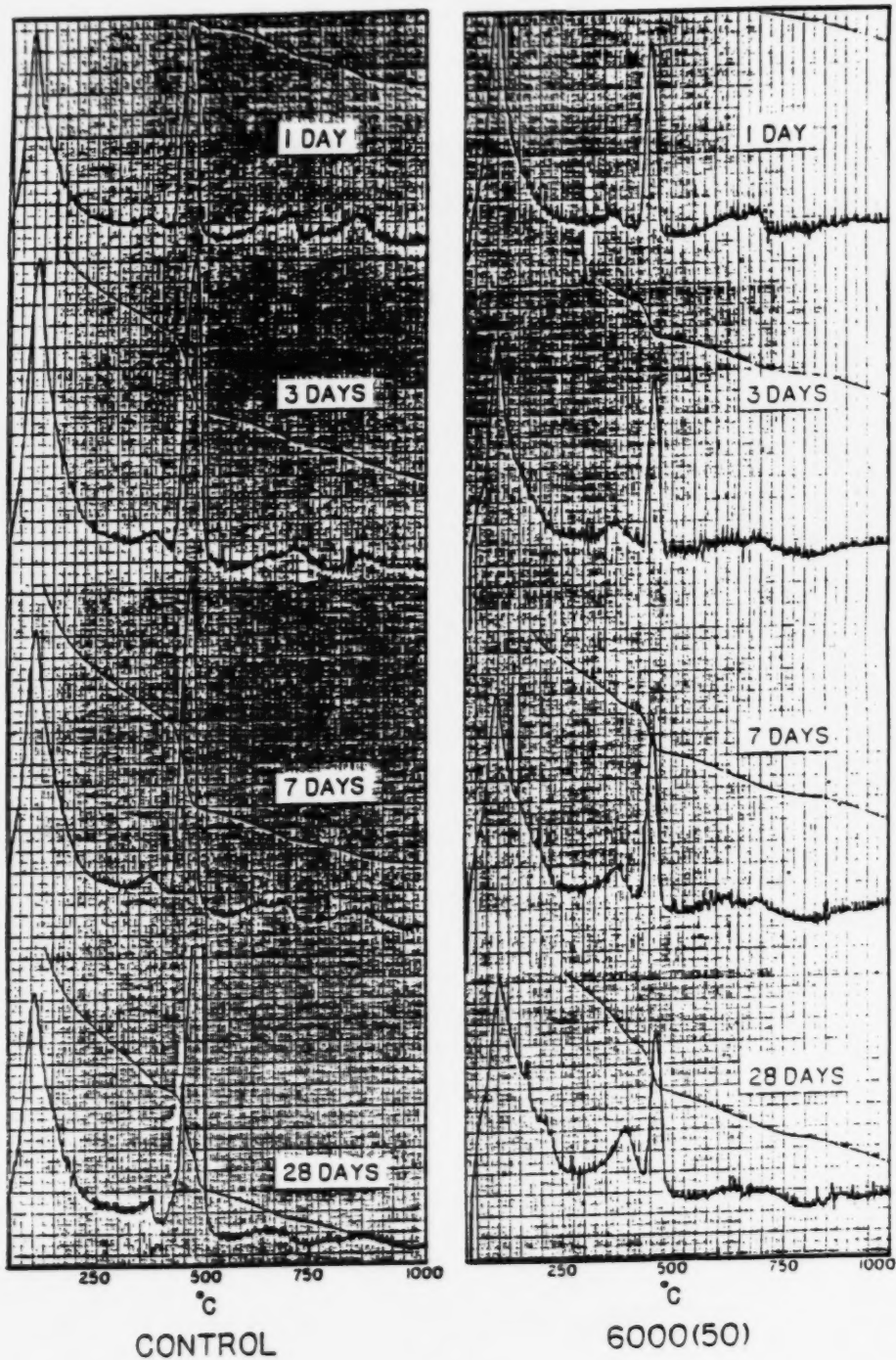


FIGURE 15. TGA/DTG₂ curves for control and OPC-BFS (50:50) pastes prepared with 6000 cm²/g slag at curing ages up to 28d.

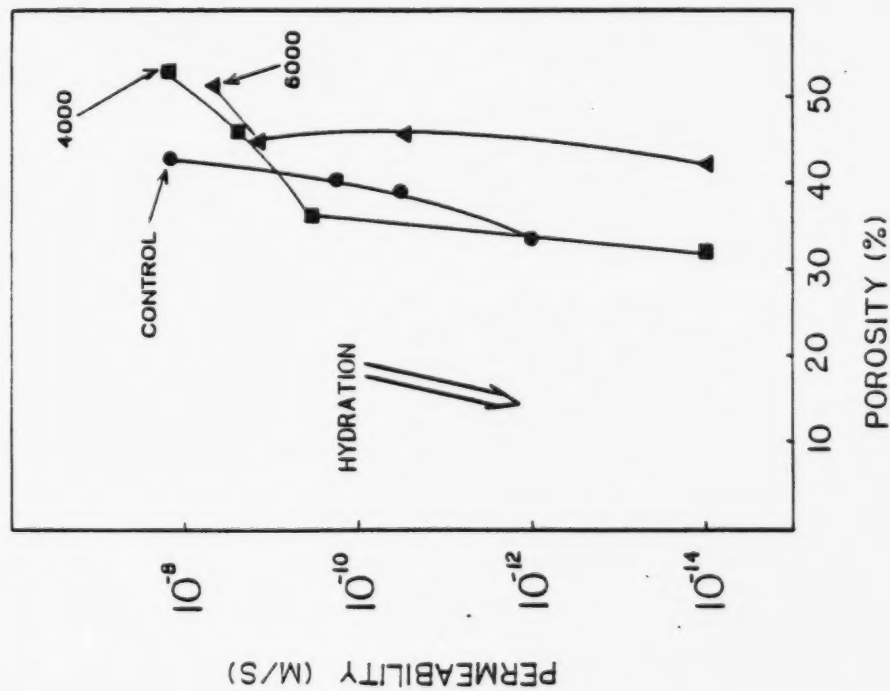


FIGURE 16. Relationship Between Permeability and Porosity for control and OPC-BFS (50:50) pastes.

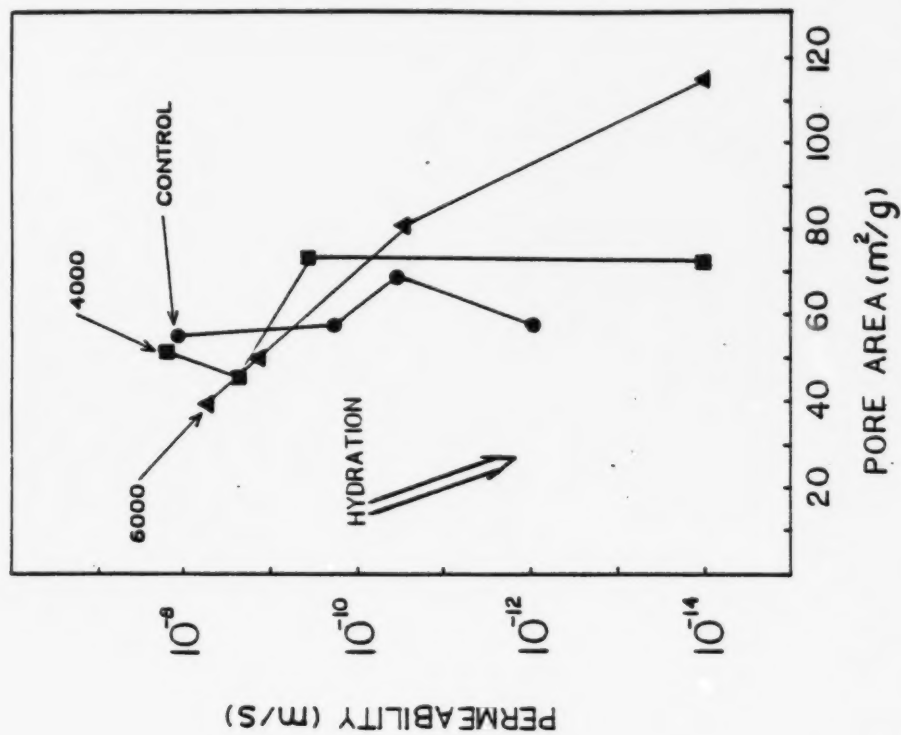


FIGURE 17. Relationship Between Permeability and Pore Surface Area for control and OPC-BFS (50:50) pastes.

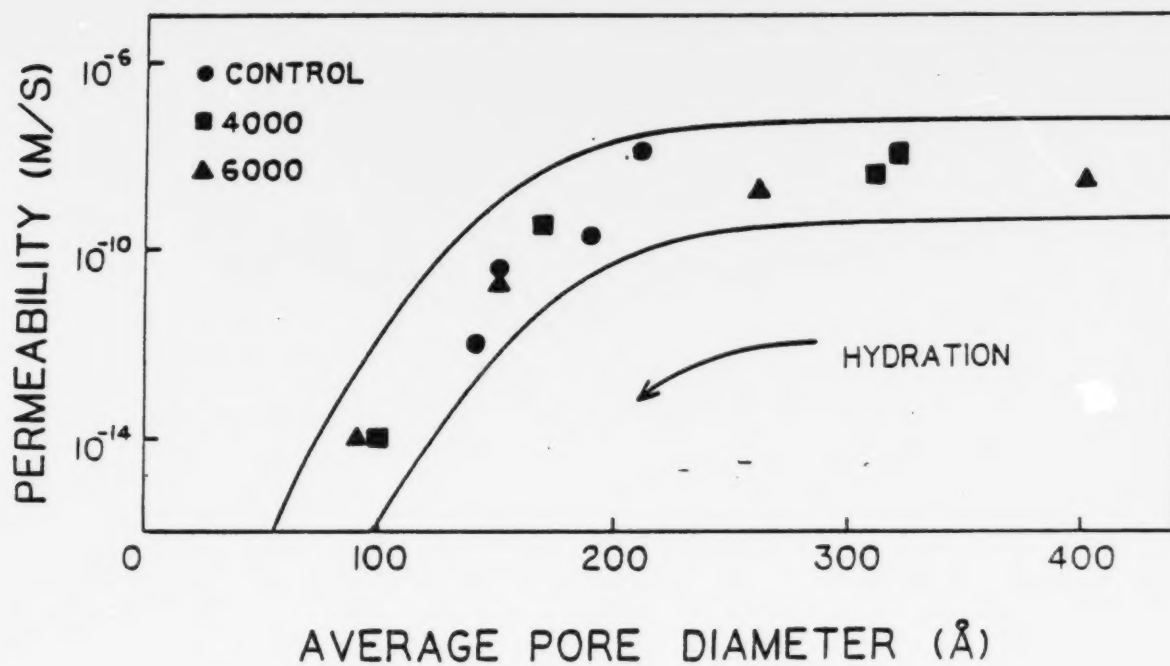


FIGURE 18. Relationship Between Permeability and Average Pore Diameter for control and OPC-BFS (50:50) pastes.

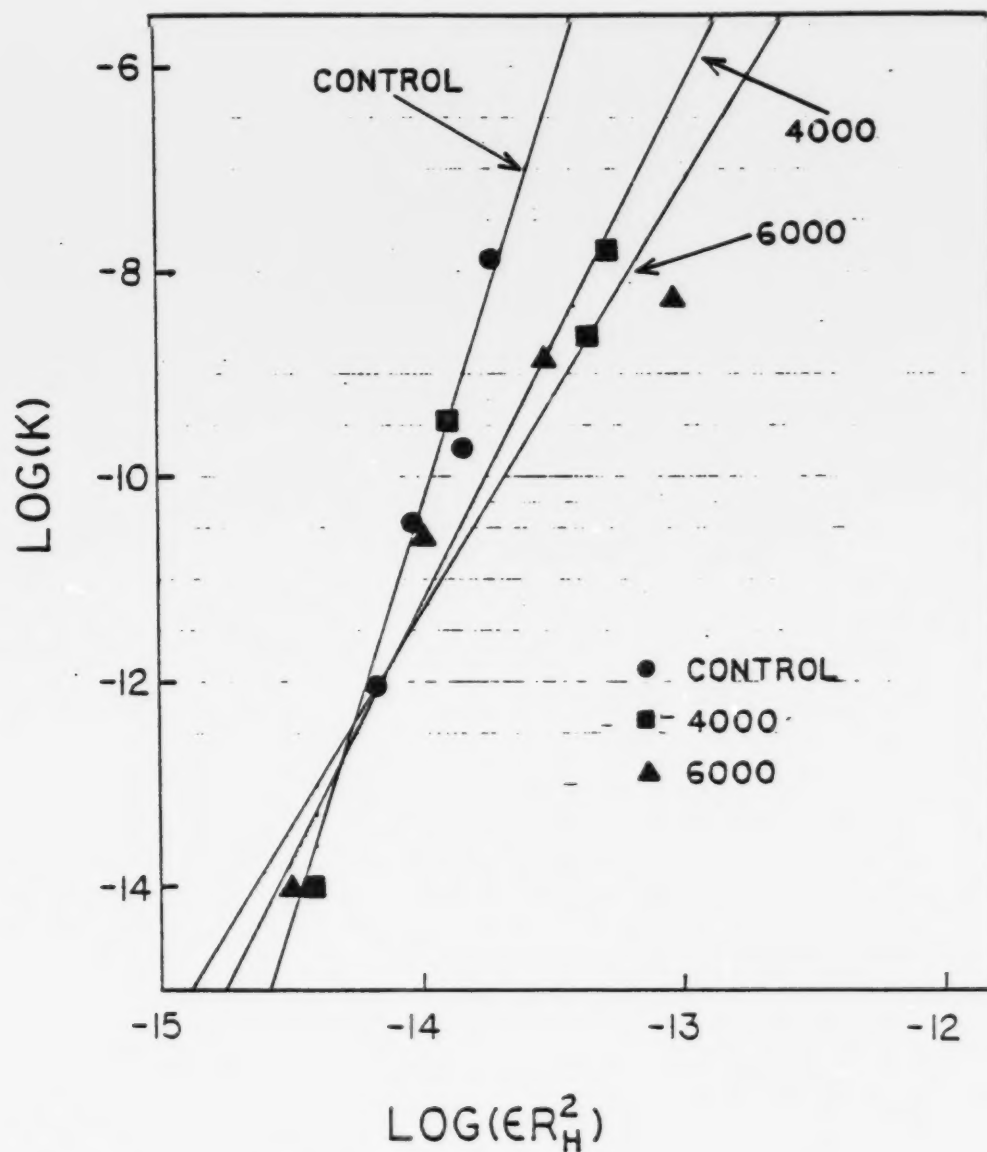


FIGURE 19. Comparison of Experimental and Calculated Data Derived from Hydraulic Radius Theory for control and OPC-BFS (50:50) pastes.

TABLES - -

TABLE 1. Chemical and Physical Characteristics of Portland Cement

Chemical Analysis(%)*		Physical Properties	
SiO ₂	21.3	.Normal Consistency(ASTM C187) 22.8%	
Al ₂ O ₃	4.3	.Vicat Set time (ASTM C191)	
Fe ₂ O ₃	2.3	initial	129 min.
MgO	3.6	final	210 min.
CaO	62.8	.Fineness (ASTM C184,C430)	
Na ₂ O	0.47	- 75 μ m	98.7%
K ₂ O	0.50	- 45 μ m	91.3%
SO ₃	2.92	.Blaine (ASTM C204) 4070 cm ² /g	
CaO (free)	0.02	.Compressive Strength of Mortar	
LOI	1.69	Cubes (ASTM C109):	
Insol. residue	0.20	1d	10.7 MPa
Bogue Composition:		3d	22.0 MPa
C ₃ S	53.2	7d	26.9 MPa
C ₂ S	21.0	28d	35.0 MPa
C ₃ A	7.5	.Autoclave Expansion	
C ₄ AF	7.0	(ASTM C151)	
CaO	0.02	0.09%	
MgO	3.6		
C ₂ H ₂	<u>6.3</u>		
Total †	98.6		

* Method ASTM C114; Fe by atomic absorption spectroscopy

† Analysis total including minor oxides, Na₂O and K₂O, insol. residue, and LOI not associated with gypsum = 100.3%.

TABLE 2. Chemical Analysis (% w/w) Data for Slags

Element	4000 cm ² /g	5000 cm ² /g	6000 cm ² /g
SiO ₂	38.1	38.4	37.8
Al ₂ O ₃	8.7	8.8	8.8
Fe ₂ O ₃	0.35	0.61	0.60
CaO	32.6	32.3	31.8
MgO	18.7	18.6	18.4
Na ₂ O	0.22	0.22	0.22
TiO ₂	0.36	0.36	0.36
K ₂ O	0.80	0.71	0.72
MnO	1.39	1.41	1.39
P ₂ O ₅	<0.01	<0.01	<0.01
BaO	0.03	0.03	0.03
SrO	0.05	0.05	0.05
ZrO ₂	0.01	0.01	0.01
SO ₃ *	2.80	2.36	2.28
LOI	-2.06	-2.01	-1.88
Total	99.22	99.48	98.27
Hydraulic Index**	1.58	1.56	1.56

* Total sulphur as SO₃** CaO + MgO + Al₂O₃/SiO₂

TABLE 3. Slag Activity Index Data for OPC-8FS Mortars*

Mortar I.D.	Mix Proportions				Flow Value	W/C†	Compressive Strength, psi.					Slag Activity Index, %
	Cement (gm)	Sand (gm)	Slag (gm)	Water (ml)			Age	i	ii	iii	Avg.	
Reference	500	1375	—	232	107	0.464	7	5288	4938	5063	5096	—
							28	5675	5675	5825	5725	—
4000 cm ² /g	250	1375	250	230	108	0.460	7	3250	2850	3238	3113	61
							28	5825	5675	5850	5783	101
5000 cm ² /g	"	"	"	230	109	0.460	7	3275	3475	3388	3379	66
							28	6300	6325	6250	6292	110
6000 cm ² /g	"	"	"	225	108	0.450	7	4188	4375	4188	4250	83
							28	5075	5100	5350	5175	90

*According to ASTM C 989

† Total binder, i.e. OPC+8FS

Table 4. Air Content of Mortars*

Mortar	Mix Proportions				Flow Value	w/c	Air Content (%)
	Cement (gm)	Sand (gm)	Slag (gm)	Water (ml)			
Reference	350	1400	—	230	86	0.657	11.0
4000 cm ² /g	—	1400	350	230	89	0.657	9.5
5000 cm ² /g	—	1400	350	225	88	0.643	8.6
6000 cm ² /g	—	1400	350	225	88	0.643	8.6

* According to ASTM C185

TABLE 5: Chemical Data for Pore Fluid Extracted
from Slag-Cement Pastes (50% w/w Slag)

Paste	Age	IONIC CONCENTRATIONS (mmol/L)									Cations*
		pH	Si	Fe	Ca	Al	Na	K	SO ₄ ²⁻	OH ⁻	
Control (0% Slag)	2h	13.11	<0.1	0.01	0.5	<0.1	77	135	69.4	129	0.80
	5h	13.13	0.4	0.01	0.9	<0.1	82	142	75.5	134	0.79
	1d	13.36	1.8	<0.01	0.6	<0.1	137	162	48.7	227	0.93
	3d	13.62	1.7	0.04	4.0	0.1	215	203	5.4	418	0.99
	7d	13.66	0.9	0.03	2.9	0.1	227	216	3.9	455	0.97
	28d	13.70	0.6	0.17	3.0	0.1	257	247	4.6	503	1.00
4000(50)	2h	13.01	0.3	0.01	0.4	<0.1	37	74	33.7	102	0.66
	5h	12.99	0.3	0.01	1.6	<0.1	40	75	36.2	99	0.69
	1d	13.25	1.0	0.01	0.8	0.1	78	90	5.9	176	0.90
	3d	13.39	0.6	0.01	1.0	0.1	113	110	0.6	246	0.91
	7d	13.45	0.6	0.02	1.1	0.2	128	123	0.7	280	0.90
	28d	13.45	0.3	0.02	2.8	<0.1	147	127	2.8	285	0.96
5000(50)	2h	13.02	<0.1	—	0.9	<0.1	36	70	4.8	105	0.94
	5h	13.02	0.4	—	0.4	0.1	38	70	27.8	104	0.68
	1d	13.28	0.1	—	0.4	<0.1	82	90	1.8	190	0.89
	3d	13.41	0.1	—	0.4	0.1	120	122	0.6	255	0.95
	7d	13.46	0.1	—	3.8	0.1	141	128	0.7	288	0.96
	28d	13.44	0.3	0.05	2.7	<0.1	147	125	2.1	274	1.00
6000(50)	2h	13.01	0.1	<0.01	1.8	<0.1	38	72	41.6	103	0.61
	5h	13.02	0.3	0.01	0.8	<0.1	39	73	37.0	105	0.63
	1d	13.28	0.1	0.01	0.7	<0.1	88	94	1.5	191	0.94
	3d	13.43	0.2	0.01	0.7	0.1	126	129	0.6	266	0.96
	7d	13.46	0.4	0.01	1.0	0.2	141	136	1.1	290	0.96
	28d	13.43	0.3	0.03	2.5	0.2	125	104	7.1	270	0.82

* Ion balance: $\frac{2 \text{ Ca} + \text{Na} + \text{K}}{2 \text{ SO}_4^{2-} + \text{OH}^-}$

TABLE 6. Chemical Data for Pore Water Extracted
from Slag-Cement Pastes (70% w/w SLAG)

Paste	Age	IONIC CONCENTRATIONS (mmol/L)									Cations* Anions
		pH	Si	Fe	Ca	Al	Na	K	SO ₄ ²⁻	OH ⁻	
Control (0% Slag)	2h	13.11	<0.1	0.01	0.5	<0.1	77	135	69.4	129	0.80
	5h	13.13	0.4	0.02	0.9	<0.1	82	142	75.5	134	0.79
	1d	13.36	1.8	<0.01	0.6	<0.1	137	162	48.7	227	0.93
	3d	13.62	1.7	0.04	4.0	0.1	215	203	5.4	418	0.99
	7d	13.66	0.9	0.03	2.9	0.1	227	216	3.9	455	0.97
	28d	13.70	0.6	0.17	3.0	0.1	257	247	4.6	503	1.00
4000(70)	2h	12.92	<0.1	—	10.4	<0.1	21	45	20.0	83	0.71
	5h	12.96	0.1	—	0.5	<0.1	23	48	17.2	92	0.57
	1d	13.15	0.5	—	0.4	0.3	60	61	0.6	142	0.85
	3d	13.24	0.1	—	0.6	0.1	76	77	0.6	175	0.88
	7d	13.29	<0.1	—	2.9	0.1	89	86	0.7	195	0.92
	28d	13.25	0.3	0.01	2.3	0.1	84	72	3.6	178	0.87
5000(70)	2h	12.91	0.1	<0.01	6.0	<0.1	25	41	27.5	81	0.57
	5h	12.96	0.3	<0.01	3.7	<0.1	24	46	25.6	92	0.54
	1d	13.17	0.2	<0.01	0.5	<0.1	56	67	0.8	148	0.83
	3d	13.27	0.1	<0.01	0.3	0.1	79	81	1.2	188	0.85
	7d	13.29	0.2	<0.01	0.6	0.1	83	85	1.2	193	0.87
	28d	13.23	0.2	<0.01	3.0	0.1	80	59	3.5	170	0.82
6000(70)	2h	12.90	0.3	<0.01	2.3	<0.1	22	45	31.2	79	0.51
	5h	12.95	0.3	0.01	2.2	0.1	24	48	23.4	88	0.50
	1d	13.20	0.2	<0.01	0.7	0.1	64	68	1.2	157	0.84
	3d	13.31	0.2	0.01	0.9	0.1	86	94	1.2	203	0.89
	7d	13.29	0.3	0.01	3.8	0.1	81	81	0.6	194	0.87
	28d	13.24	0.2	0.02	3.0	0.1	82	64	2.0	176	0.84

* Ion balance: $2 \text{ Ca} + \text{Na} + \text{K}$

$2 \text{ SO}_4^{2-} + \text{OH}^-$

TABLE 7. Chemical Data for Pore Fluids Normalized to
Initial Volume of Water (50% w/w SLAG)

Paste	Age	IONIC CONCENTRATIONS (mmol/L)								
		pH	Si	Fe	Ca	Al	Na	K	SO ₄ ²⁻	OH ⁻
Control (0% Slag)	2h	13.10	<0.1	0.01	0.5	<0.1	74	130	67.1	125
	5h	13.10	0.4	<0.01	0.8	<0.1	77	133	70.9	126
	1d	13.23	1.3	<0.01	0.4	<0.1	102	120	36.2	169
	3d	13.41	1.1	0.02	2.5	0.1	133	125	3.3	259
	7d	13.42	0.5	0.02	1.7	0.1	130	124	2.2	261
	28d	13.41	0.3	0.09	1.5	0.1	131	126	2.3	256
4000(50)	2h	13.00	0.3	0.01	0.4	<0.1	36	73	33.2	101
	5h	12.98	0.3	0.01	1.6	<0.1	39	73	35.3	96
	1d	13.17	0.9	0.01	0.7	0.1	66	76	5.0	150
	3d	13.27	0.5	0.01	0.8	0.1	86	84	0.5	188
	7d	13.28	0.4	0.01	0.8	0.1	88	85	0.5	193
	28d	13.23	0.2	0.01	1.7	<0.1	88	76	1.7	171
5000(50)	2h	13.01	<0.1	—	0.9	<0.1	35	68	4.7	103
	5h	13.00	0.4	—	0.4	0.1	37	68	26.9	101
	1d	13.20	0.1	—	0.3	<0.1	69	76	1.5	160
	3d	13.28	0.1	—	0.3	0.1	90	91	0.4	190
	7d	13.29	0.1	—	2.6	0.1	96	87	0.5	196
	28d	13.20	0.2	0.03	1.6	<0.1	86	73	1.2	160
6000(50)	2h	13.00	0.1	<0.01	1.8	<0.1	37	71	40.8	101
	5h	13.01	0.3	0.01	0.8	<0.1	38	71	35.8	102
	1d	13.19	0.1	0.01	0.6	<0.1	71	76	1.2	154
	3d	13.29	0.1	0.01	0.5	0.1	91	94	0.8	193
	7d	13.28	0.3	0.01	0.7	0.1	92	89	0.7	190
	28d	13.18	0.2	0.02	1.4	0.1	70	58	4.0	150

TABLE 8. Chemical Data for Pore Fluids Normalized to
Initial Volume of Water (70% w/w SLAG)

Paste	Age	IONIC CONCENTRATIONS (mmol/L)								
		pH	Si	Fe	Ca	Al	Na	K	SO ₄ ²⁻	OH ⁻
Control (0% Slag)	2h	13.10	<0.1	0.01	0.5	<0.1	74	130	67.1	125
	5h	13.10	0.4	<0.01	0.8	<0.1	77	133	70.9	126
	1d	13.23	1.3	<0.01	0.4	<0.1	102	120	36.2	169
	3d	13.41	1.1	0.02	2.5	0.1	133	125	3.3	259
	7d	13.42	0.5	0.02	1.7	0.1	130	124	2.2	261
	28d	13.41	0.3	0.09	1.5	0.1	131	126	2.3	256
4000(70)	2h	12.91	<0.3	—	10.3	<0.1	21	45	19.8	82
	5h	12.96	0.1	—	0.5	<0.1	23	47	16.9	91
	1d	13.12	0.4	—	0.4	0.3	54	55	0.5	133
	3d	13.20	0.1	—	0.5	0.1	64	64	0.5	157
	7d	13.17	0.2	—	2.2	0.1	69	67	0.5	149
	28d	13.08	0.1	0.01	1.5	0.1	56	48	2.4	119
5000(70)	2h	12.90	0.1	<0.01	5.9	<0.1	25	41	27.3	80
	5h	12.96	0.3	<0.01	3.7	<0.1	24	46	25.3	91
	1d	13.12	0.2	<0.01	0.4	<0.1	50	59	0.7	131
	3d	13.19	0.1	<0.01	0.2	0.1	65	66	1.0	154
	7d	13.16	0.2	<0.01	0.5	0.1	63	64	0.9	146
	28d	13.04	0.1	<0.01	2.0	0.1	53	42	1.3	111
6000(70)	2h	12.89	0.3	<0.01	2.3	<0.1	22	45	31.0	78
	5h	12.94	0.3	0.01	2.2	0.1	24	47	23.1	87
	1d	13.14	0.2	<0.01	0.6	0.1	56	60	1.1	138
	3d	13.21	0.2	0.01	0.7	0.1	68	74	1.0	161
	7d	13.15	0.2	0.01	2.8	0.1	59	59	0.4	141
	28d	13.05	0.1	0.01	1.9	0.1	52	40	1.3	111

TABLE 9. TGA/DTG Data for OPC-BFS Pastes (50% Replacement)

Paste	Age	Ca(OH) ₂ Content		Bound Water Content	
		Per 100g Total Binder	Per 100g OPC	Per 100g Total Binder	Per 100g OPC
Control (0% Slag)	2h	1.50	1.50	1.67	1.67
	5h	2.69	2.69	3.03	3.03
	1d	14.30	14.30	12.88	12.88
	3d	20.46	20.46	19.02	19.02
	7d	24.19	24.19	21.30	21.30
	28d	26.50	26.50	24.51	24.51
4000(50)	2h	0.22	0.44	0.72	1.44
	5h	0.65	1.30	1.27	2.54
	1d	7.31	14.62	7.52	15.05
	3d	10.57	21.13	11.86	23.72
	7d	12.77	25.53	15.58	31.15
	28d	14.23	28.46	20.05	40.10
5000(50)	2h	0.39	0.78	1.08	2.16
	5h	0.72	1.45	1.57	3.14
	1d	7.02	14.03	7.85	15.70
	3d	10.71	21.42	12.66	25.32
	7d	12.27	24.54	16.02	32.05
	28d	14.62	29.24	20.84	41.67
6000(50)	2h	0.23	0.46	0.91	1.82
	5h	1.36	2.72	1.61	3.22
	1d	7.68	15.37	9.58	19.16
	3d	10.41	20.83	13.74	27.47
	7d	12.23	24.46	17.24	34.48
	28d	14.54	29.08	22.46	44.92

TABLE 10. TGA/DTG Data for OPC-BFS Pastes (70% Replacement)

Paste	Age	Ca(OH) ₂ Content		Bound Water Content	
		Per 100g Total Binder	Per 100g OPC	Per 100g Total Binder	Per 100g OPC
Control (0% Slag)	2h	1.50	1.50	1.67	1.67
	5h	2.69	2.69	3.03	3.03
	1d	14.30	14.30	12.88	12.88
	3d	20.46	20.46	19.02	19.02
	7d	24.19	24.19	21.30	21.30
	28d	26.50	26.50	24.51	24.51
4000(70)	2h	0.0	0.0	0.47	1.57
	5h	0.17	0.57	0.76	2.53
	1d	4.14	14.70	5.20	17.32
	3d	6.14	20.47	8.15	27.16
	7d	8.31	27.70	11.28	37.60
	28d	9.93	33.09	16.61	55.37
5000(70)	2h	0.34	1.12	0.43	1.44
	5h	0.38	1.27	0.57	1.91
	1d	4.16	13.87	5.63	18.77
	3d	5.80	19.34	9.01	30.04
	7d	7.59	25.30	12.27	40.90
	28d	9.70	32.33	17.49	58.29
6000(70)	2h	0.0	0.0	0.32	1.05
	5h	0.0	0.02	0.58	1.95
	1d	4.15	13.84	6.19	20.65
	3d	6.50	21.67	10.35	34.51
	7d	7.86	26.19	13.63	45.45
	28d	9.79	32.63	18.48	61.62

TABLE 11. Porosimetry and Permeability Data on BFS-Cement Pastes

Pasta/Age	Total Pore Area (m ² /g)	Average Pore Diam. (μm)	Bulk Density (g/cm ³)	Skeletal Density(g/cm ³)	Porosity (%)	Permeability	
						m/sec	Darcy
Control							
1d	54.1	0.021	1.53	2.68	42.9	1.3 x 10 ⁻⁸	1.4 x 10 ⁻³
3d	58.0	0.019	1.45	2.42	40.3	2.0 x 10 ⁻¹⁰	2.0 x 10 ⁻⁵
7d	68.8	0.015	1.50	2.47	39.0	3.4 x 10 ⁻¹¹	3.5 x 10 ⁻⁶
28d	58.9	0.014	1.61	2.44	33.8	9.7 x 10 ⁻¹³	1.0 x 10 ⁻⁷
4000 cm ² /g							
1d	52.5	0.032	1.25	2.61	52.3	1.7 x 10 ⁻⁸	1.7 x 10 ⁻³
3d	45.5	0.031	1.32	2.45	46.0	2.4 x 10 ⁻⁹	2.4 x 10 ⁻⁴
7d	72.7	0.017	1.43	2.59	44.7	3.7 x 10 ⁻¹⁰	3.8 x 10 ⁻⁵
28d	72.4	0.011	1.55	2.28	31.9	<10 ⁻¹⁴	<10 ⁻⁹
6000 cm ² /g							
1d	40.4	0.040	1.28	2.61	51.1	5.5 x 10 ⁻⁹	5.6 x 10 ⁻⁴
3d	49.1	0.026	1.39	2.52	45.0	1.6 x 10 ⁻⁹	1.6 x 10 ⁻⁴
7d	80.8	0.015	1.47	2.67	45.1	3.1 x 10 ⁻¹¹	3.2 x 10 ⁻⁶
28d	115.0	0.009	1.57	2.71	42.0	<10 ⁻¹⁴	<10 ⁻⁹

APPENDIX A

Detailed Numeric and Graphical Particle Size
Analysis Data

ONTARIO RESEARCH FINEPARTICLE LAB

DATE: FEB 28 85
SAMPLE: 4000 cm²/g
ELECTROLYTE: ISOTON
DISPERSANT: IA
EQUIPMENT: TA II
APERTURES: 30 70 280
OPERATOR: SMITH
COMMENTS: 30 SEC USB

CH.#	SIZE	DIFF VOL %	CUM VOL %

1	.4	0	100
2	.5	0	100
3	.63	.02	100
4	.79	.16	99.98
5	1	.35	99.83
6	1.26	.75	99.48
7	1.59	1.29	98.73
8	2	1.98	97.44
9	2.52	2.59	95.46
10	3.18	3.51	92.87
11	4	4.43	89.36
12	5.04	5.36	84.94
13	6.35	6.19	79.57
14	8	7.13	73.38
15	10.08	8.28	66.26
16	12.7	10.09	57.97
17	16.01	11.78	47.88
18	20.17	11.86	36.1
19	25.41	10.44	24.24
20	32.01	7.55	13.8
21	40.33	4.4	6.25
22	50.82	1.42	1.85
23	64.02	.43	.43
24	80.67	0	0
25	101.63	0	0
26	128.05	0	0

***** VOLUME % STATISTICS *****

MEAN: 13.18 UM
MEDIAN: 15.25 UM
MODE 20.43 UM
STANDARD DEVIATION: 2.34 UM
COEF. VAR.: 17.79 %
SKEWNESS: .69 NEGATIVE
KURTOSIS: 4.41 LEPTOKURTIC

100% SAMPLE: 4000 cm²/g

VOLUME %

0

4

8

2

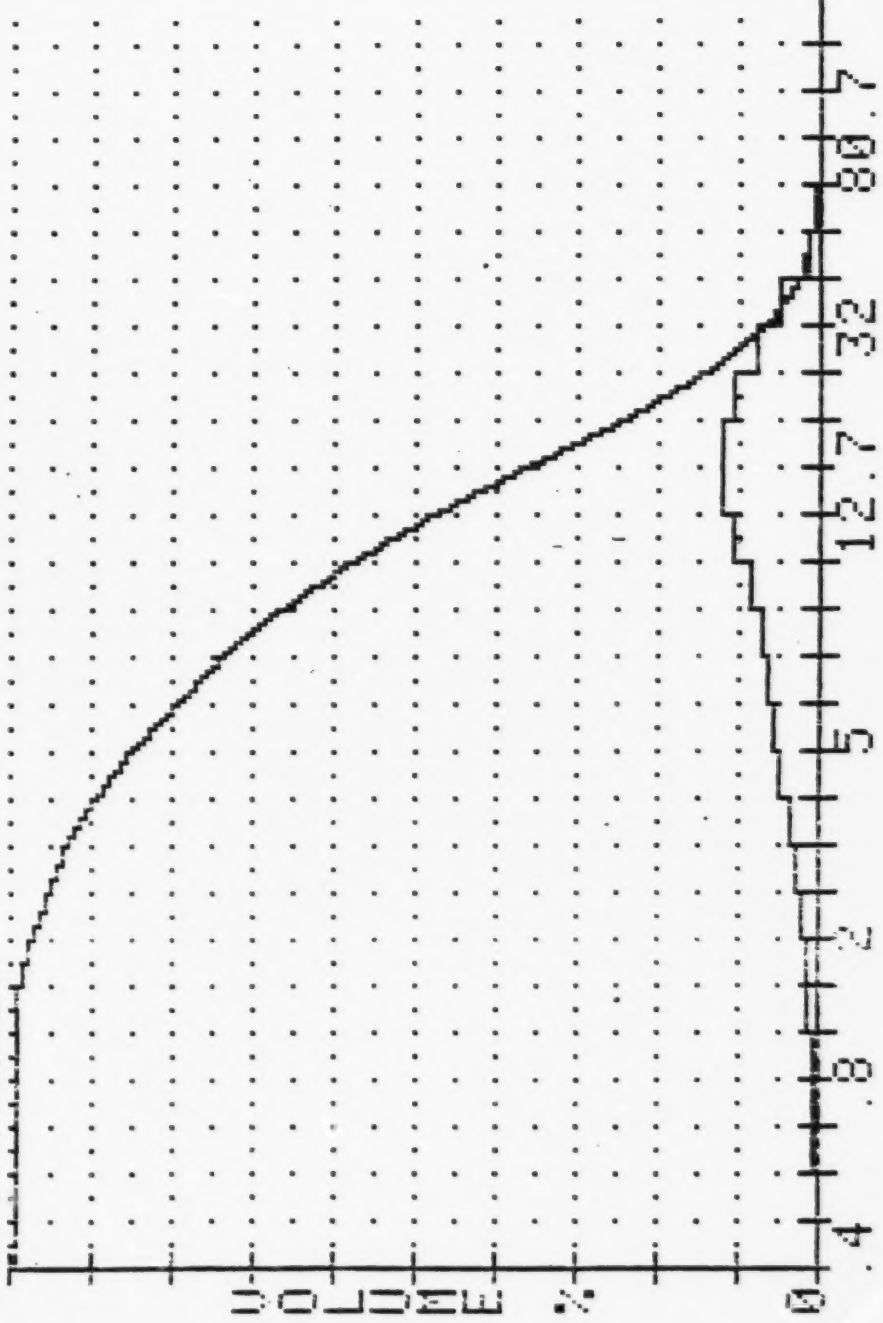
5

12.7

32

80.7

SIZE IN UM



ONTARIO RESEARCH FINEPARTICLE LAB

DATE: FEB 28 85
SAMPLE: 5000 cm²/g
ELECTROLYTE: ISOTON
DISPERSANT: IA
EQUIPMENT: TA II
APERTURES: 30 70 280
OPERATOR: SMITH
COMMENTS: 30 SEC USB

CH.#	SIZE	DIFF VOL %	CUM VOL %

1	.4	0	100
2	.5	0	100
3	.63	.2	100
4	.79	.57	99.8
5	1	.63	99.22
6	1.26	1.35	98.59
7	1.59	2.17	97.24
8	2	3.26	95.07
9	2.52	4.24	91.81
10	3.18	5.31	87.57
11	4	6.02	82.26
12	5.04	6.72	76.24
13	6.35	6.72	69.52
14	8	7.37	62.8
15	10.08	7.78	55.42
16	12.7	8.93	47.64
17	16.01	9.75	38.71
18	20.17	9.73	28.96
19	25.41	8.67	19.23
20	32.01	6.17	10.56
21	40.33	3.09	4.39
22	50.82	.83	1.31
23	64.02	.11	.47
24	80.67	0	.36
25	101.63	0	.36
26	128.05	.36	.36

***** VOLUME % STATISTICS *****

MEAN:	10.51 UM
MEDIAN:	11.85 UM
MODE	20.06 UM
STANDARD DEVIATION:	2.57 UM
COEF. VAR.:	24.44 %
SKEWNESS:	.74 NEGATIVE
KURTOSIS:	7.39 LEPTOKURTIC

100% SAMPLE : 5000 cm²/g

VOLUME %

0

4

8

2

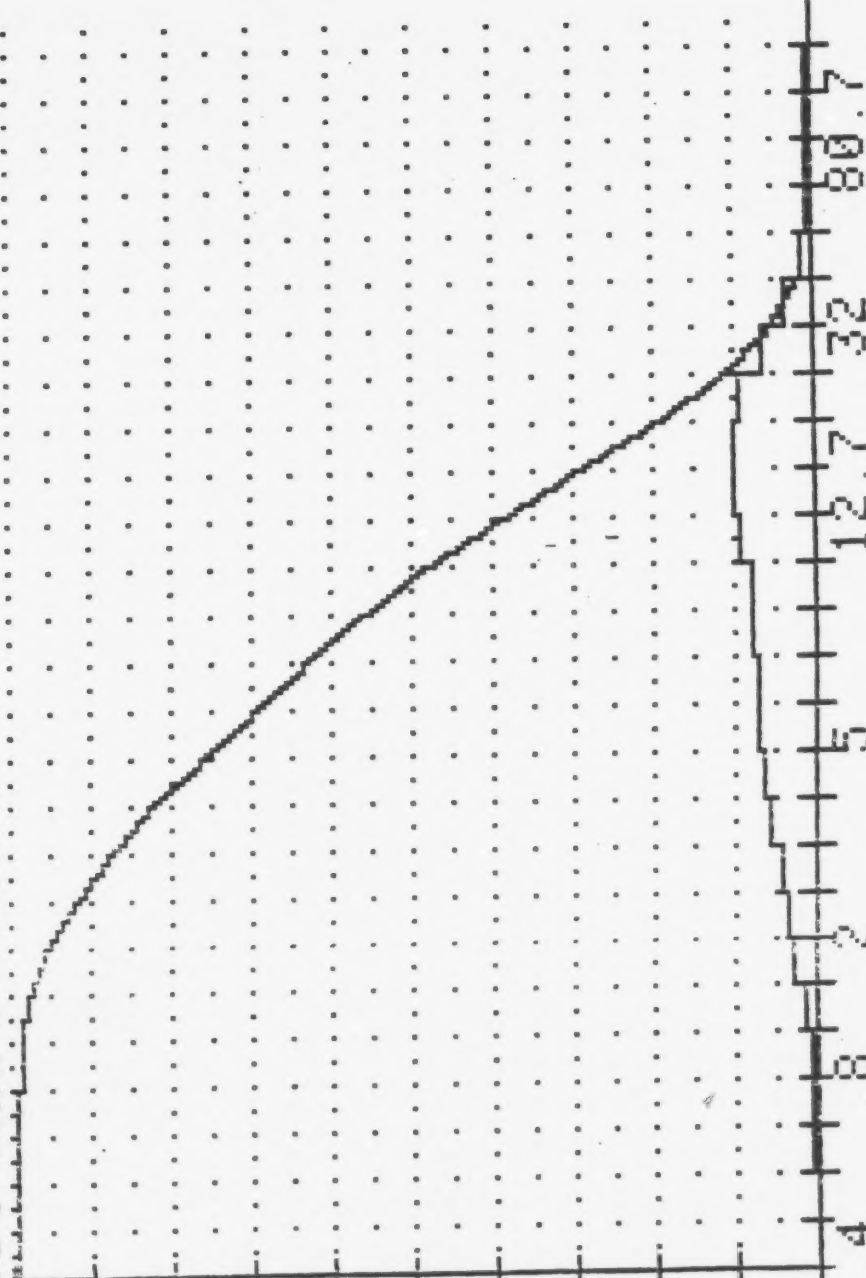
5

12.7

32

80.7

SIZE IN UM



ONTARIO RESEARCH FINEPARTICLE LAB

DATE: FEB 28 85J
SAMPLE: 6000 cm²/g
ELECTROLYTE: ISOTON
DISPERSANT: IA
EQUIPMENT: TA II
APERTURES: 30 70 280
OPERATOR: SMITH
COMMENTS: 30 SEC USB

CH.#	SIZE	DIFF VOL %	CUM VOL %

1	.4	0	100
2	.5	0	100
3	.63	.44	100
4	.79	.97	99.56
5	1	1.56	98.59
6	1.26	2.52	97.03
7	1.59	3.48	94.5
8	2	4.56	91.02
9	2.52	5.19	86.46
10	3.18	6.23	81.27
11	4	6.8	75.03
12	5.04	7.29	68.24
13	6.35	7.36	60.94
14	8	7.65	53.59
15	10.08	7.48	45.94
16	12.7	8.65	38.46
17	16.01	9.18	29.81
18	20.17	8.5	20.63
19	25.41	6.44	12.13
20	32.01	3.88	5.69
21	40.33	1.09	1.82
22	50.82	.03	.73
23	64.02	.18	.69
24	80.67	.17	.51
25	101.63	.05	.35
26	128.05	.3	.3

***** VOLUME % STATISTICS *****

MEAN:	8.25 UM
MEDIAN:	8.92 UM
MODE	17.71 UM
STANDARD DEVIATION:	2.65 UM
COEF. VAR.:	32.15 %
SKEWNESS:	.81 NEGATIVE
KURTOSIS:	9.01 LEPTOKURTIC

100% SAMPLE : 6000 cm²/g

VOLUME %

0

4

8

2

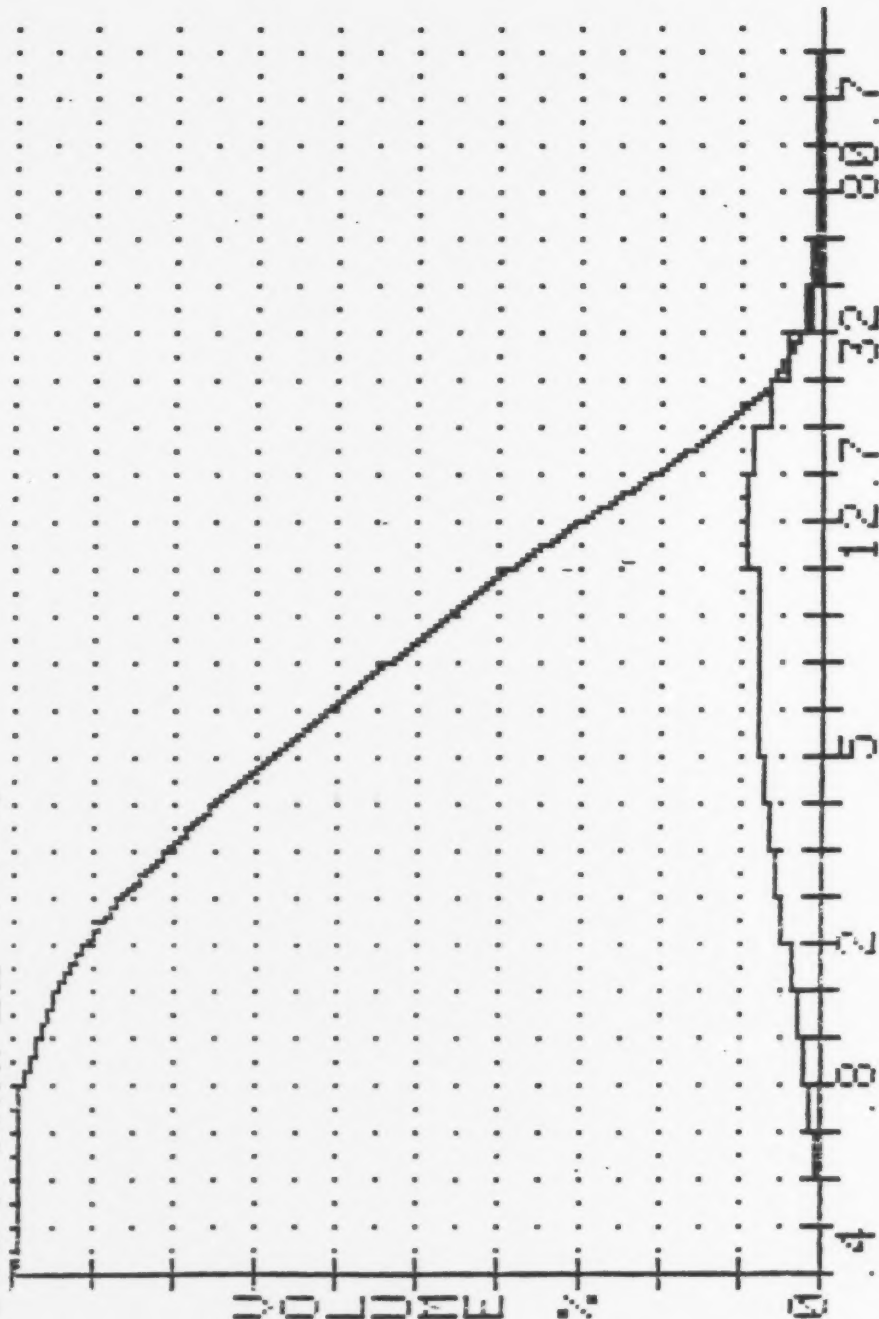
5

12.7

32

60.7

SIZE IN UM



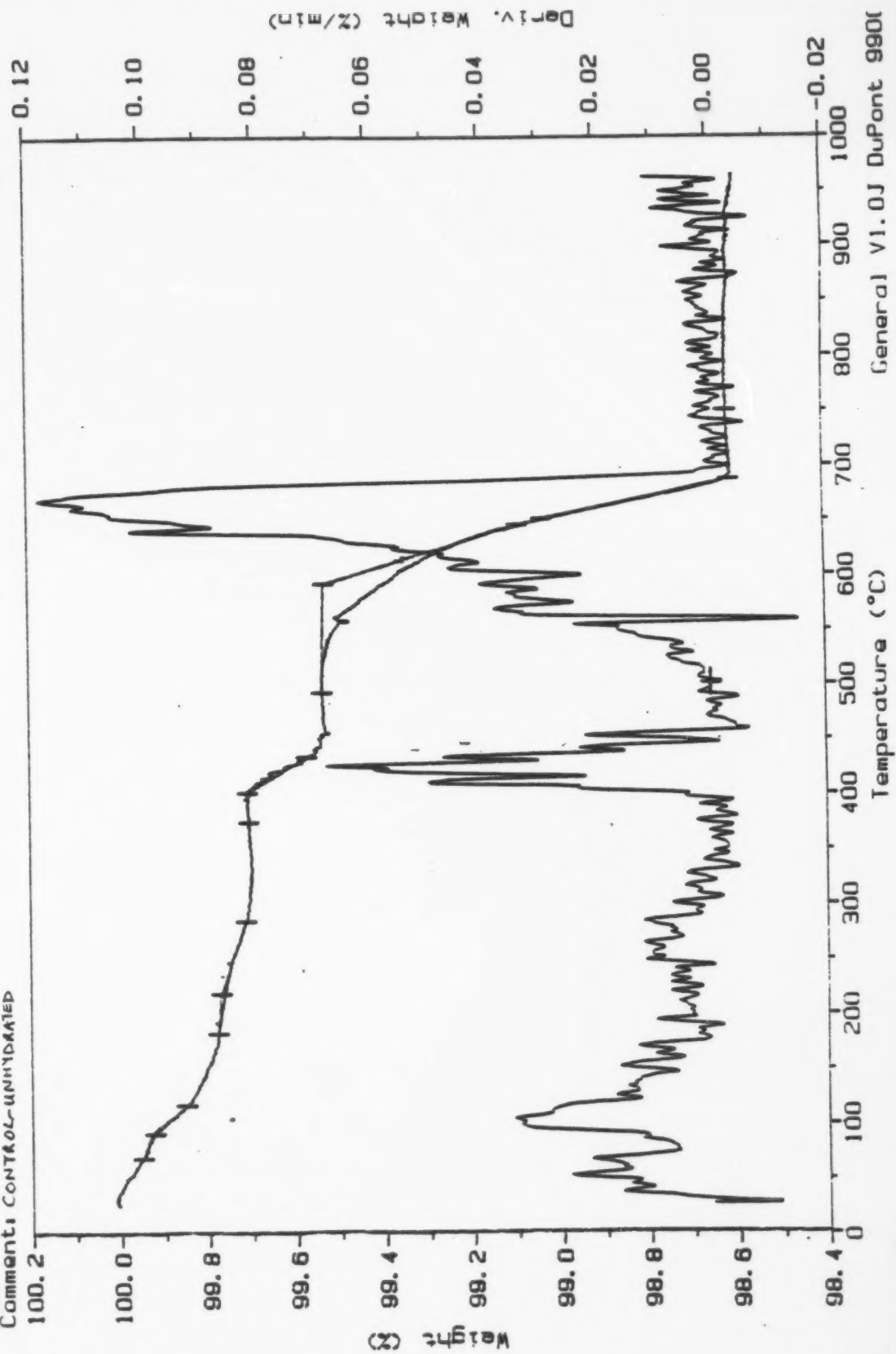
APPENDIX B

TGA/DTG Raw Data for
Slag-Cement Pastes

Sample: UNHYDRATED CEMENT
Size: 42.92 mg
Method: RAY
Comment: CONTROL-UNHYDRATED

TGA

File: RAY.01
Operator: JOAN MCGANN
Run date: 08/09/85 09:59



PART NO. 990526

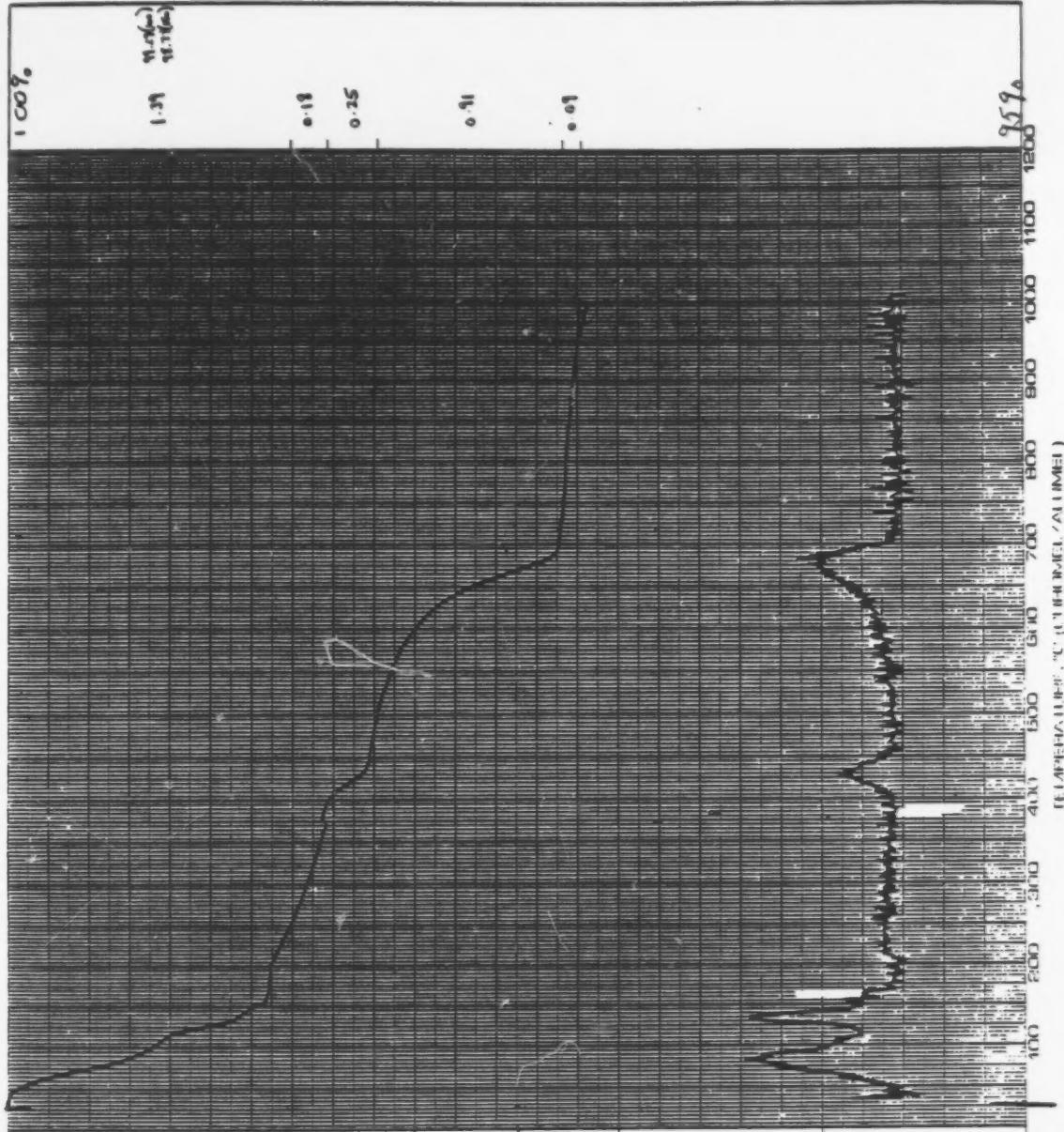
RUN NO. _____ DATE JULY 11, 1965
 OPERATOR J.M.
 SAMPLE C6H12O6 26
 ATM d1
 FLOW RATE 100 cc/min

T-AXIS

PHOS. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SENSIT., cm 10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 SENSITIVITY, mv/cm 39.90
 RANGE, mv/cm 1
 WEIGHT, mg 42.02
 TIME CONST., sec 1
 µV 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 µV _____



Du Pont Instruments

MEASURED VARIABLE

PART NO. 990526

RUN NO. _____ DATE JULY 15, 1975

OPERATOR J.M.

SAMPLE CONDISTOL SL

ATM N₂

FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10

RANGE, °C/cm 50

HEAT ☒ COOL 180

SHIFT, cm ±10

TIME, min/cm 25

TGA 60 µg/mv DTG 80 µg/(min mv)

SUPPRESSION, mv 41.67

RANGE, mv/cm 1

WEIGHT, mg 43.84

TIME CONST., sec 1

dY 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)

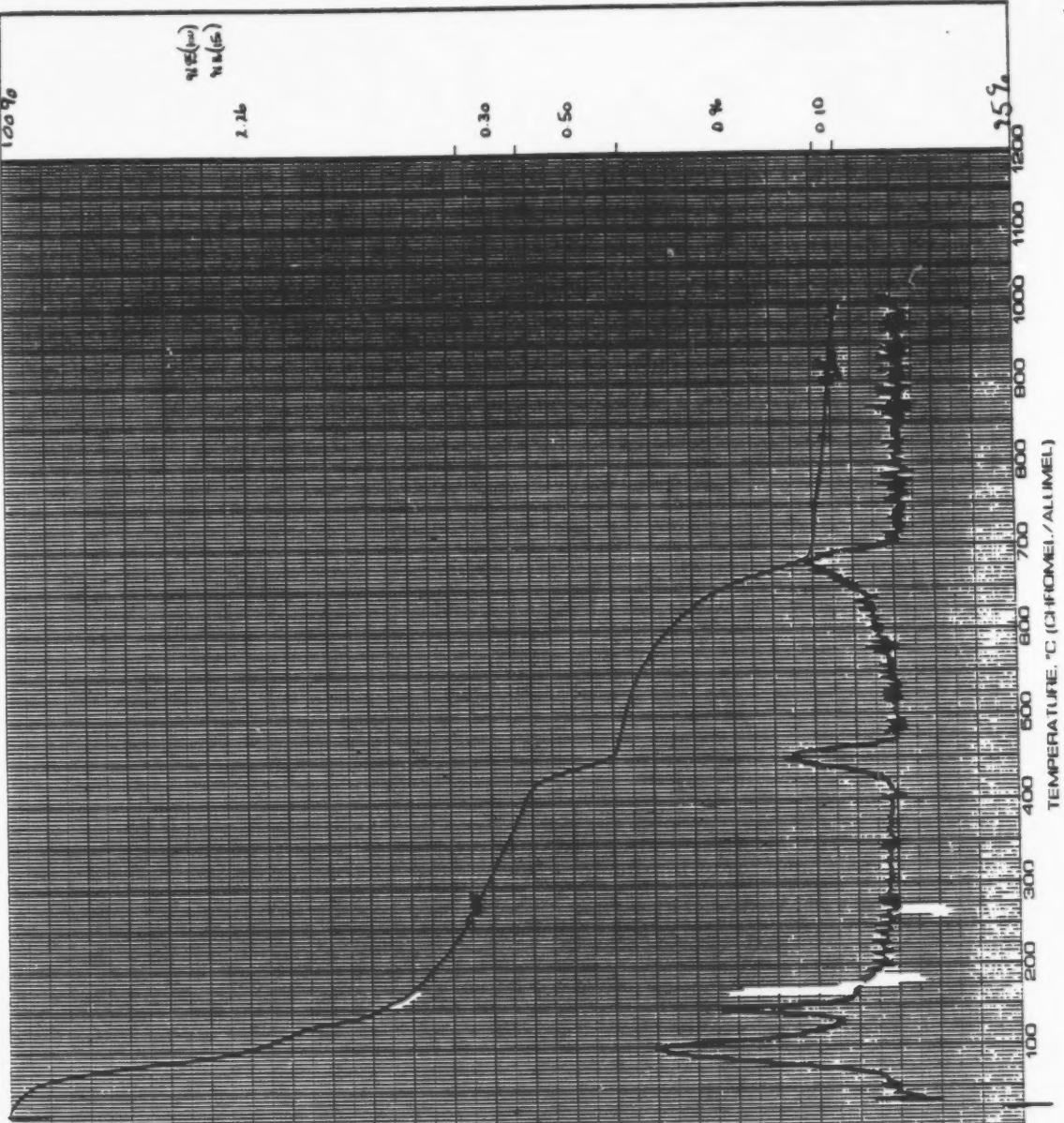
MODE _____

RANGE, mv/cm _____

SAMPLE SIZE _____

LOAD, g _____

dY _____



DuPont Instruments

MEASURED VARIABLE

PART NO. 990526

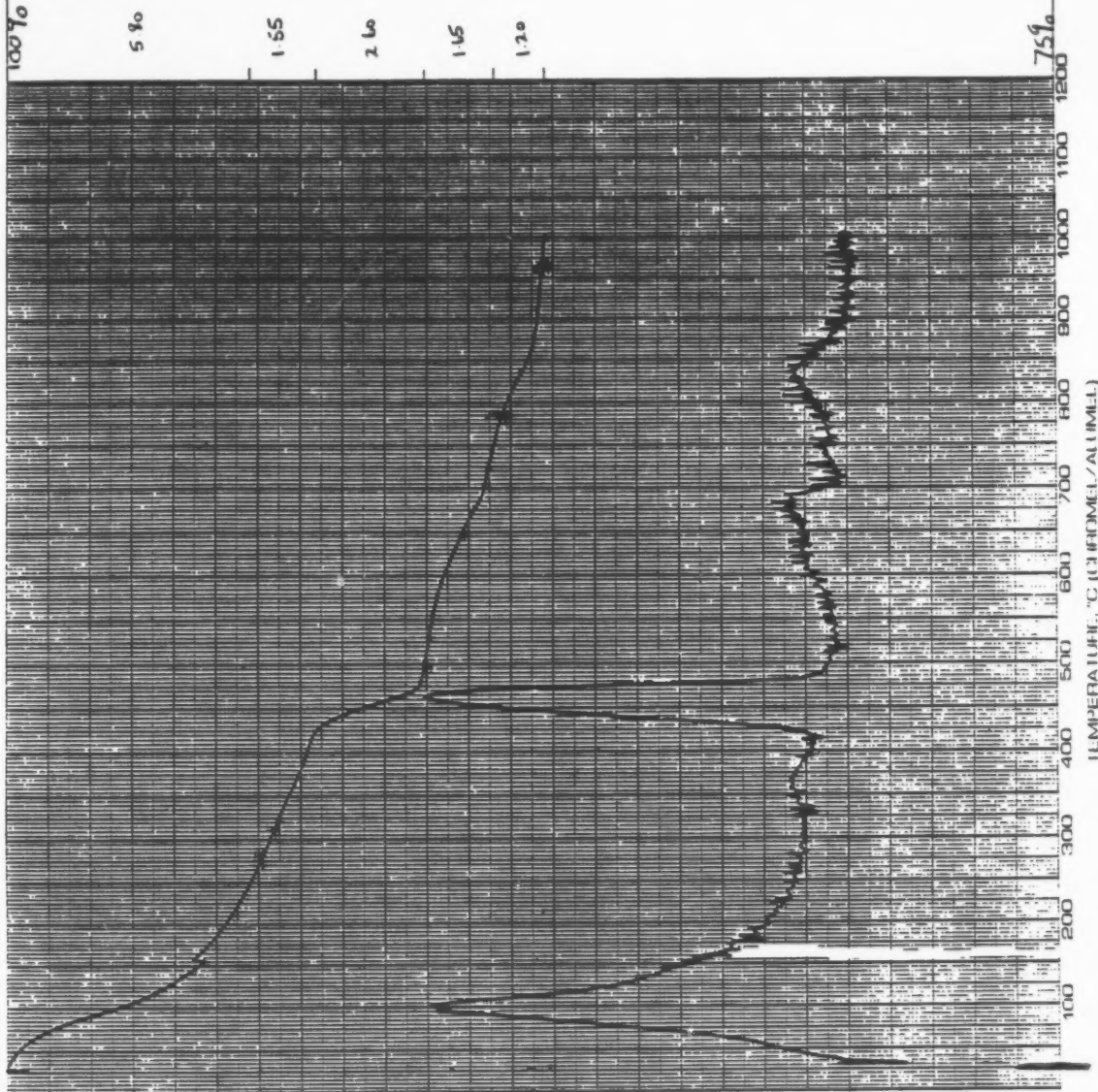
RUN NO. _____ DATE JULY 23 1965
 OPERATOR S.M.
 SAMPLE CONTROL 14
 ATN NZ
 FLOW RATE 100 cc/min

T-AXIS

HEAT RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL ☐
 SPLIT, cm 10
 TIME, min/cm 25

TGA 50 μ g/mv DTG 50 μ g/(min mv)
 SPLIT POSITION, mv 26.91
 RANGE, mv/cm 5
 WEIGHT, mg 35.89
 TIME CONST., sec 1
 dY 5

TMA 1 μ m/mv DTM 0.1 μ m/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



DuPont Instruments

MEASURED VARIABLE

PART NO. 990526

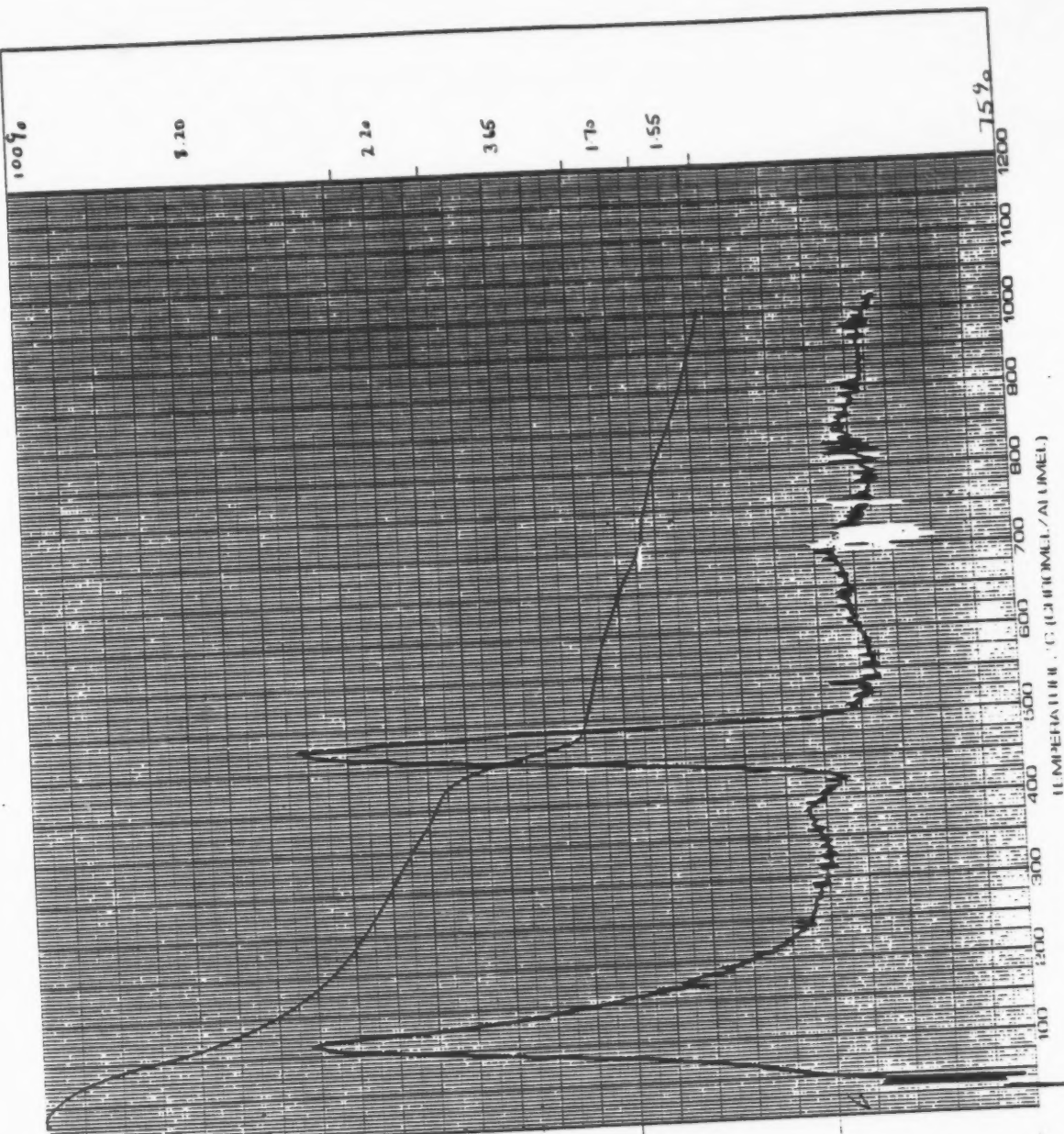
RUN NO. _____ DATE JULY 11, 1965
 OPERATOR J.M.
 SAMPLE CONTROL 34
 AIM AL. 0
 FLOW RATE 100 cc/min

T-AXIS

FLOW RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT °C/COL 180
 SPLIT, cm 110
 TIME, min/cm 22

TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mv 32.14
 RANGE, mv/cm 5
 WEIGHT, mg 42.99
 TIME CONST., sec 1
 dV .5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dV _____



PART NO. 990526

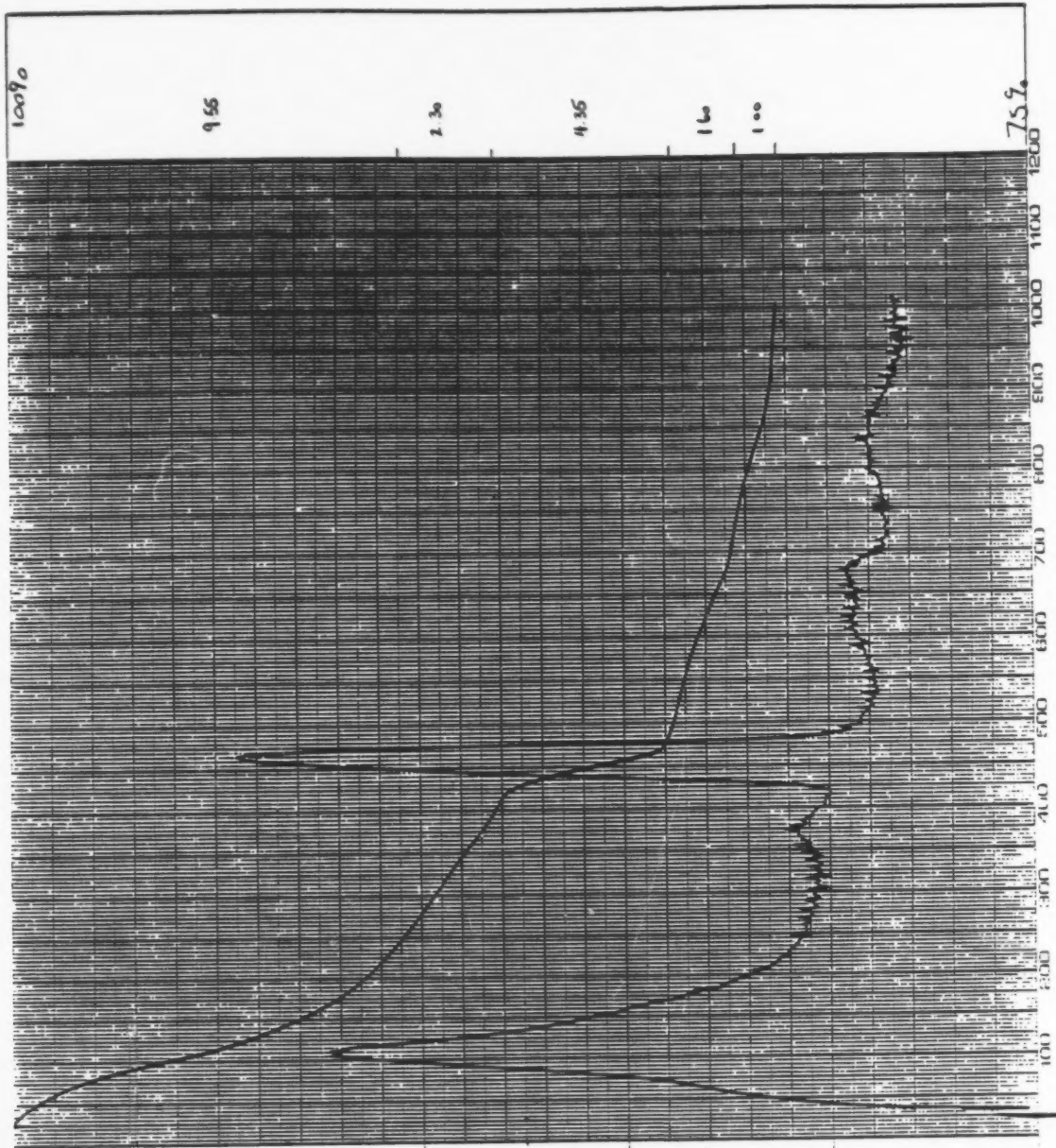
INSTRUMENT DATE JULY 10, 1975
 OPERATOR J.M.
 SAMPLE CONTAINER 74
 AIM N₂ W
 FLOW RATE 100 cc/min

T-AXIS

FURNACE RATE, °C/min 10
 FURNACE, °C/cm 50
 FLAT ☒ CUCR 180
 SAMPLE, cm 110
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 EXHHAUSTION, mg 27.76
 FURNACE, mv/cm 5
 WEIGHT, mg 37.01
 TIME CONST., sec 1
 MV 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE
 FURNACE, mv/cm
 SAMPLE SIZE
 LOAD, g
 MV



WEIGHT (mg) (TEMPERATURE (°C/MIN))

DuPont Instruments

MEASURED VARIABLE

Du Pont Instruments

MEASURED VARIABLE: TEMPERATURE

PART NO. 990526

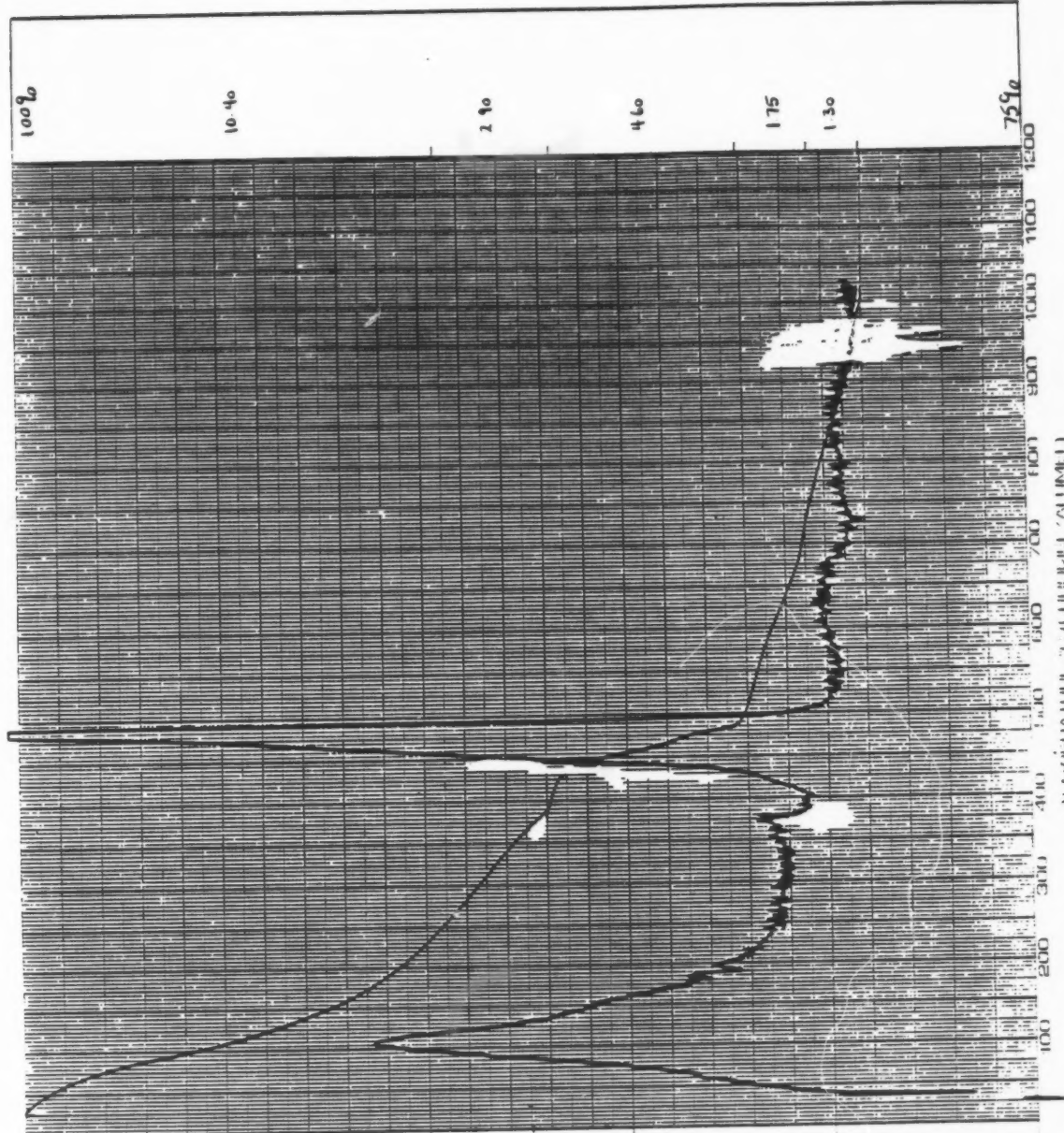
RUN NO. 1 DATE APR 8, 1952
 OPERATOR EM
 SAMPLE CONTROL 284
 AIM Ni
 FLOW RATE 100 cc/min

T-AXIS

PRESS. RATE, °C/min 11
 RANGE, °C/cm 50
 HEAT 2 CURR. 150
 SENS., cm 110
 TIME, min/cm 25

TGA 50 μ /mv DTG 50 μ /min (mv)
 EXPRESSION, mv 22.48
 RANGE, mv/cm 5
 WEIGHT, mv 29.94
 TIME CONST., sec 1
 DIV 5

TMA 1 μ /mv DTM 0.1 μ /min (mv)
 RANGE, mv/cm
 SAMPLE SIZE
 DIAL, 0
 DIV



11. 10044101000 11. 10044101000 (ATTN: 11)

PART NO. 990524

IR IN NO. DATE JULY 31 1955

OPERATOR J.M.

SAMPLE 4000 (50) 2L

AIM N₂ "

FLOW RATE 100 CC/min

T-AXIS

PIRUS RATE, °C/min 10

RANGE, °C/cm 50

HEAT ☒ COOL 150

SHIFT, cm 110

TIME, min/cm 25

TGA 50 μ g/mv DTG 50 μ g/(min mv)

SUPPRESSION, mv 42/5

RANGE, mv/cm 1

WEIGHT, mg 44.26

TIME CONST., sec 1

GY .5

TMA 1 μ m/mv DTM 0.1 μ m/(min mv)

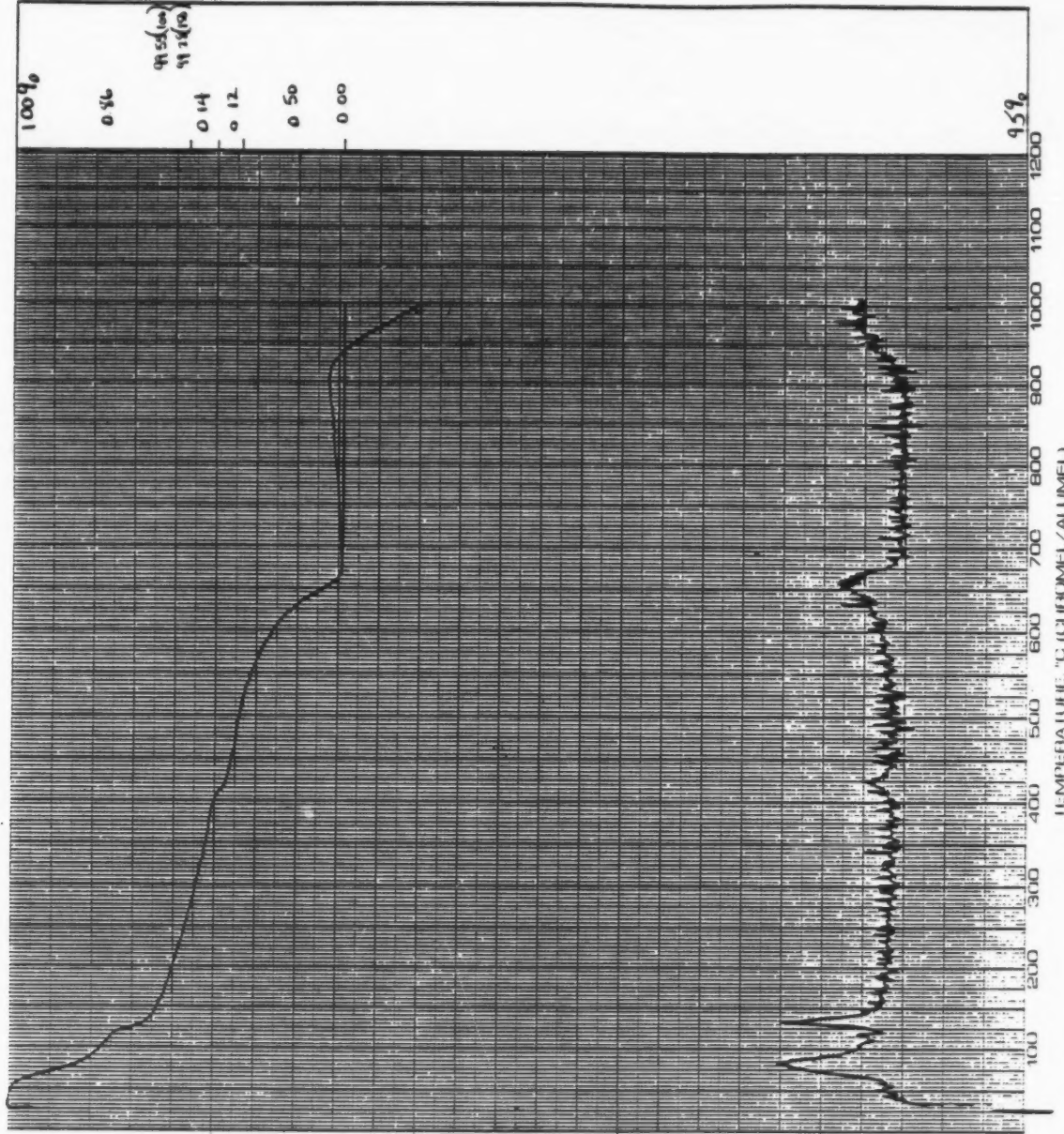
NUCLE

RANGE, mv/cm

SAMPLE SIZE

LOAD, g

GY



PART NO. 990526

INSTRUMENT DATE JULY 5, 1963

OPERATOR J. M.

SAMPLE 4000 (50) SL

AIM N E

FLOW RATE 5.0 SC (min)

T. AXIS

HEATING RATE, °C/min 10

HEATING, °C/cm 50

HEAT ☒ COOL ☐ ISO

SWITCH, cm 10

TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)

SEPRESSION, mg 41.88

HANDLE, mv/cm 1

WEIGHT, mg 44.06

TIME CONST., sec 1

dy .5

TMA 1 µm/mv DIM 0.1 µm/(min mv)

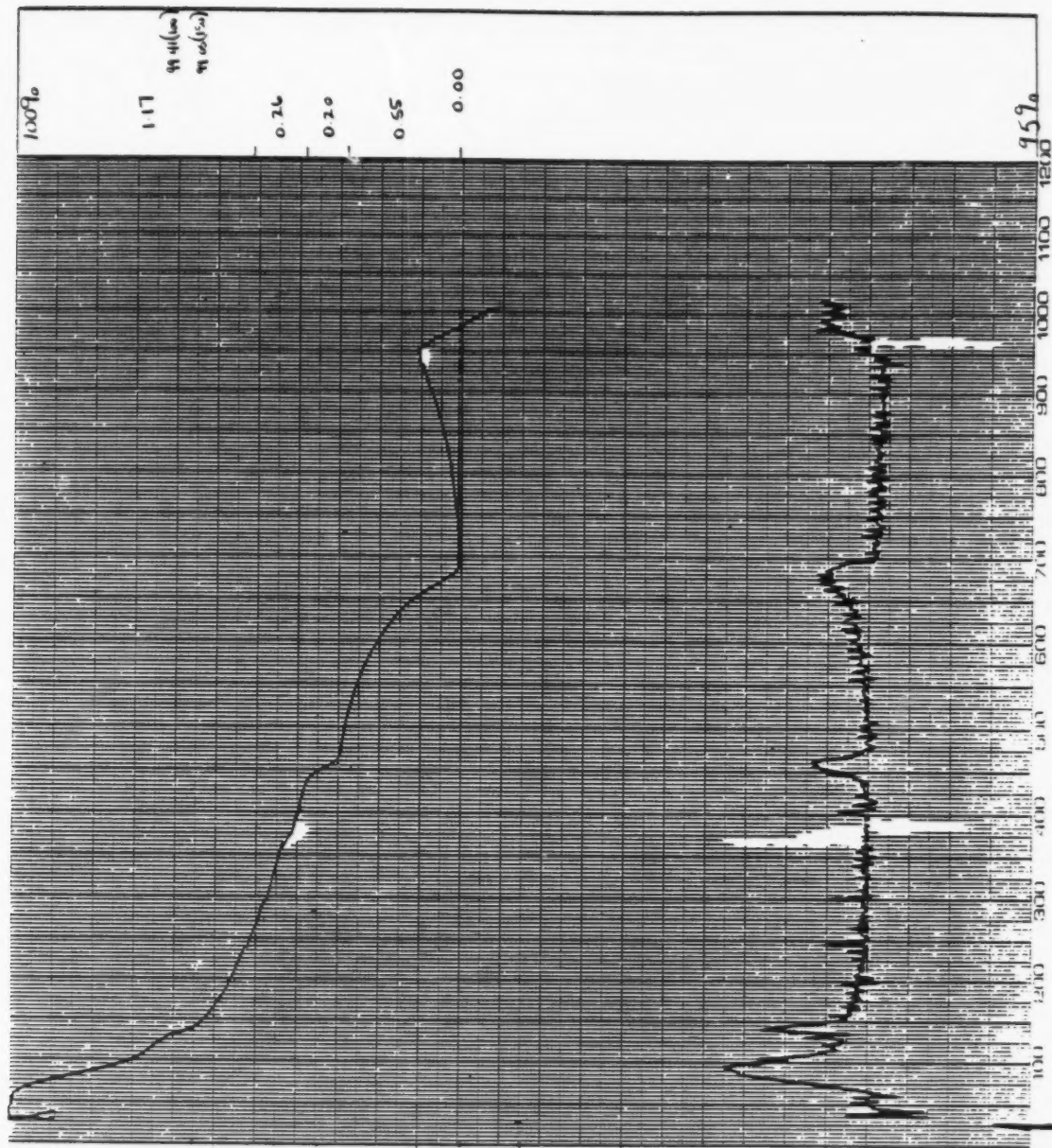
MARKER

HANDLE, mv/cm

SAMPLE SIZE

LOAD, U

dy



11-0014-110-1 (THERMAL ANALYSIS)

DuPont Instruments

MEASURED VARIABLE

PART NO. 990326

Du Pont Instruments

MEASURED VARIABLE

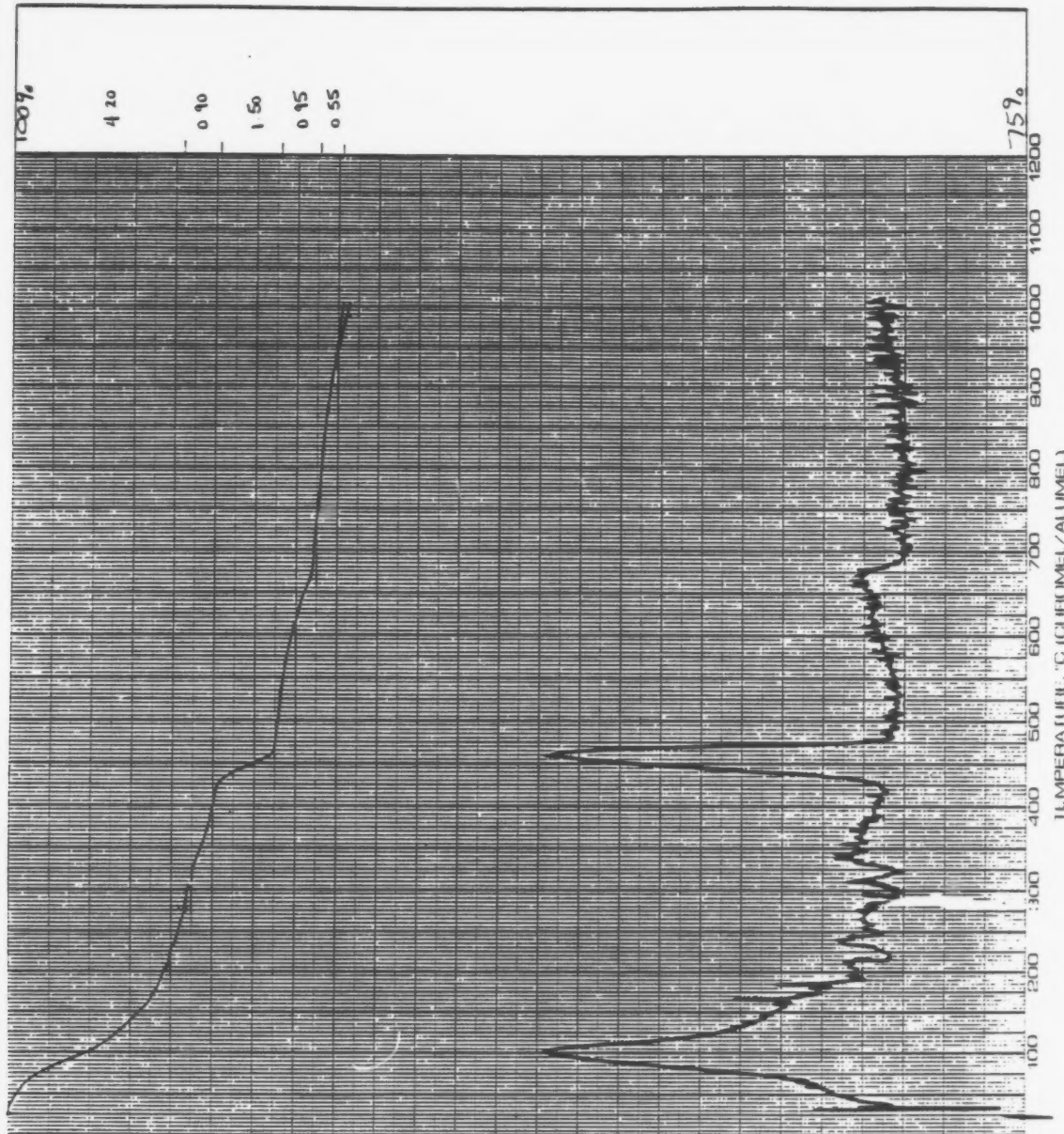
PRINTED DATE JULY 18, 1966
 OPERATOR J.M.
 SAMPLE APPROX (50) 14
 ATM N₂ 0
 FLOW RATE 100 cc/min

T-AXIS

HEAT RATE, °C/min 10
 FAN SPEED, °C/cm 50
 HEAT X COOL 180
 SENSITIVITY, cm ±10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 EXPRESSION, mg 31.85
 RANGE, mv/cm 5
 WEIGHT, mg 42.47
 TIME CONST., sec 1
 DY .5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MIXER
 RANGE, mv/cm
 SAMPLE SIZE
 LOAD, g
 DY



PART NO. 990526

RUN NO. DATE 4/24/85

OPERATOR J.M.

SAMPLE #000 (50) 34

AIM NL 6

FLOW RATE 100 cc/min

T-AXIS

HEAT RATE, °C/min 12

RANGE, °C/cm 50

HEAT L COOL ISO

SHUT, cm 110

TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/min mv

EXPRESSION, mg 28.34

RANGE, mv/cm 5

WEIGHT, mg 37.79

TIME CONST, sec 1

dy .5

TMA 1 µm/mv DTM 0.1 µm/min mv

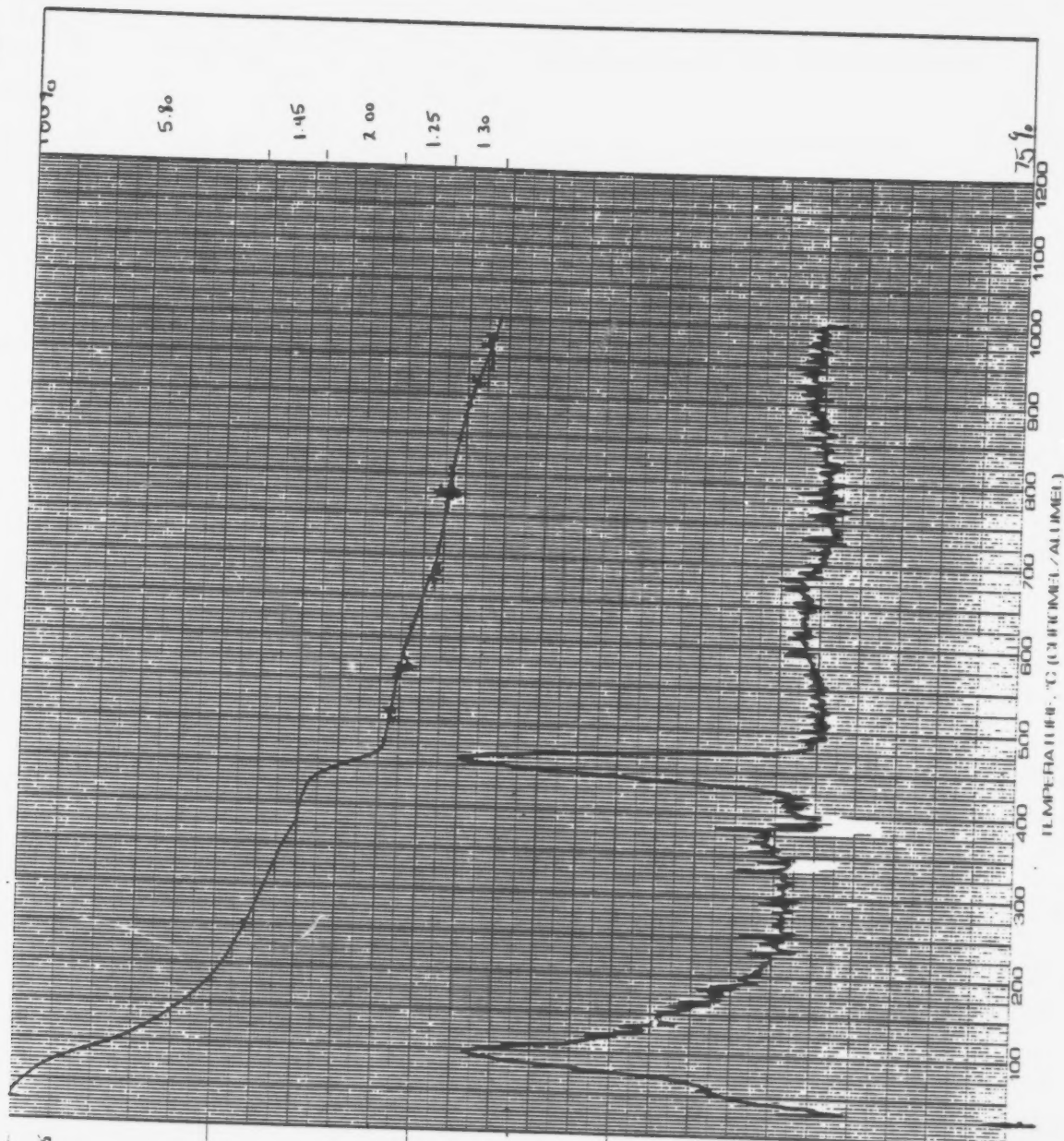
MODE

RANGE, mv/cm

SAMPLE SIZE

LOAD, g

dy



DuPont Instruments

MEASURED VARIABLE

PART NO. 990526

IRRMJ DATE JULY 9, 1965

INITIALS JMS
SAMPLE 4000 (50) 7A

AIM N₂ H

FLOW RATE 100 cc/min. d

T-AXIS

HEAT RATE, °C/min 10

HANDEL, °C/min 50

HEAT ☒ CURR ISO

SHUT, cm 110

TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)

EXPRESSION, mg 30.29

HANDEL, mv/cm 5

WEIGHT, mg 40.48

TIME CONST., sec 1

dy 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)

MARK

HANDEL, mv/cm

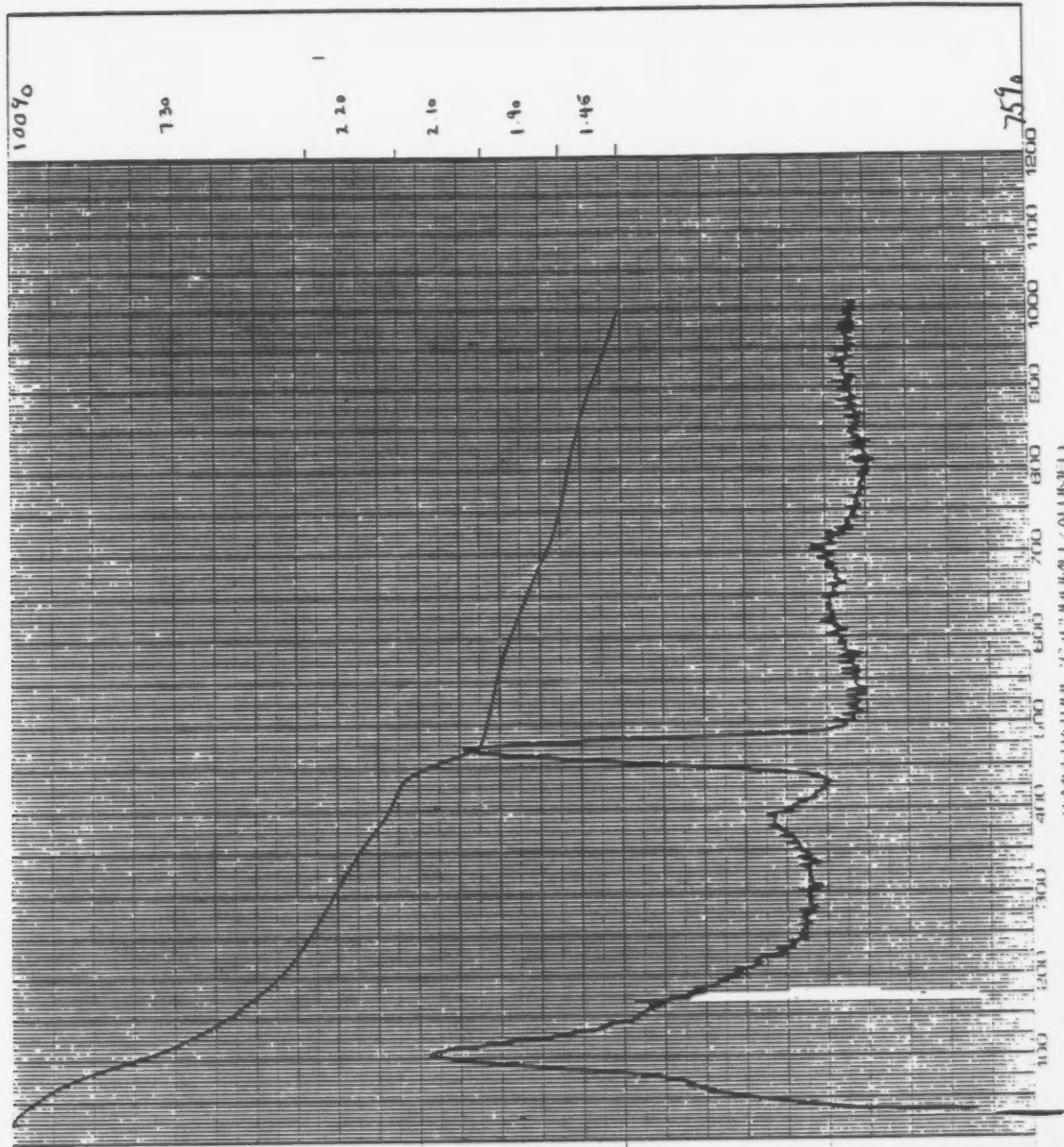
SAMPLE SIZE

INITIAL, U

dy

DuPont Instruments

MEASURED VARIABLE



PART NO. 990526

INSTR DATE JULY 24/65

OPERATOR JCM

SAMPLE 4000 (50) 381

ATM N₂ @ 0.2

FLOW RATE 100 cc/min

T-AXIS

TEMP RATE, °C/min 10

HEAT, °C/cm 50

FLAT ☒ COOL 150

TEMP, °C 110

TEMP, °C/cm 25

IGA 50 µg/mv DTG 50 µg/min mv

CELL RESISTION, mv 23.30

HANSE, mv/cm 5

WEIGHT, mg 31.10

TIME CONST., sec 1

dy 5

TMA 1 µm/mv OTM 0.1 µm/min mv

MODE

HANSE, mv/cm

SAMPLE SIZE

LOAD, g

dy

100%

9.25

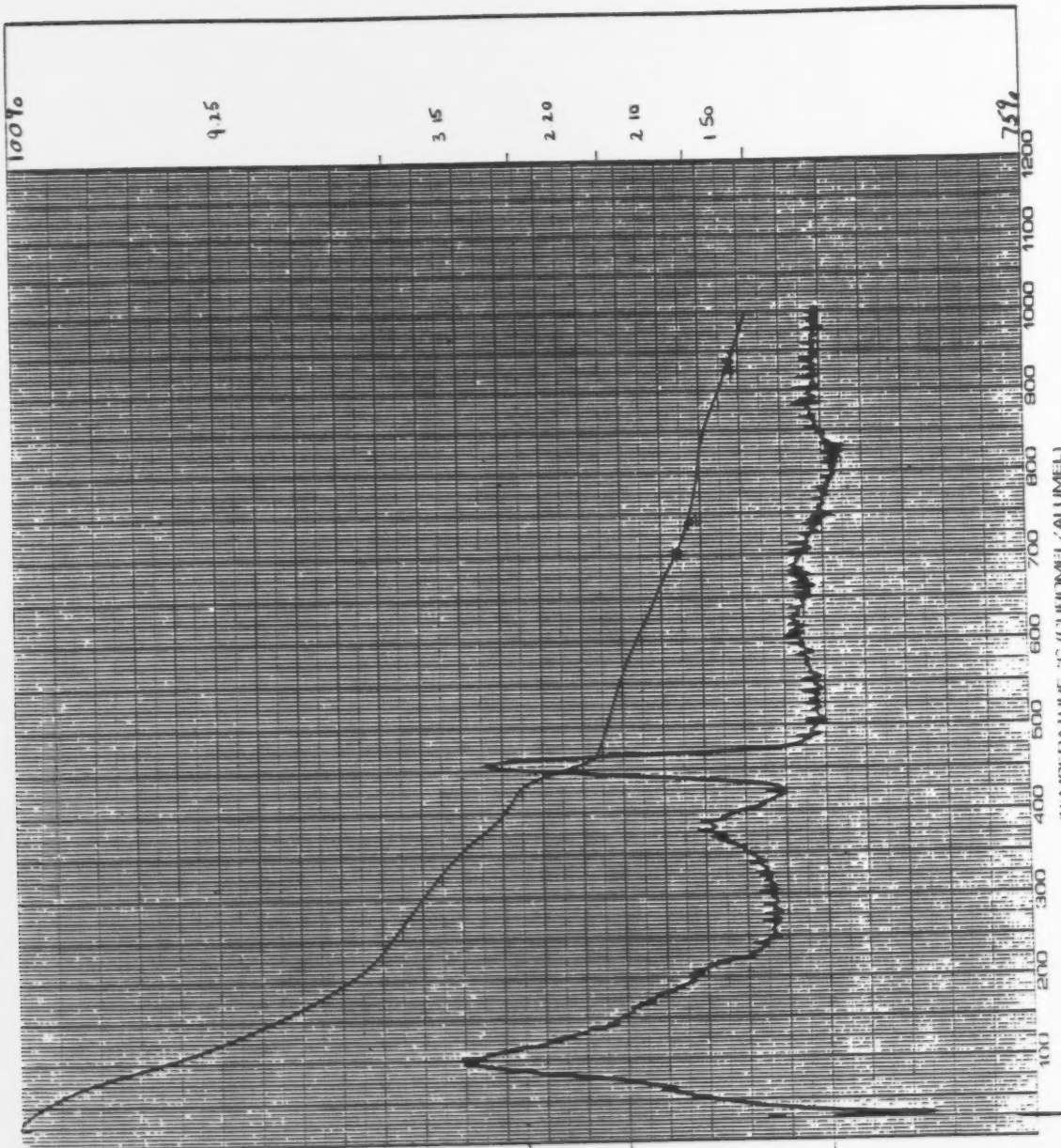
3.15

2.20

2.10

1.50

75%



TEMPERATURE, °C (CHROMEL/ALUMEL)

Du Pont Instruments

MEASURED VARIABLE - WEIGHT LOSS

PART NO. 990526

TURNING DATE 5/10/75

EXPIRATION 3 yr

SAMPLE 4000 (10) 2 hr

AIM ALZ 4

FLOW RATE 10000 ml/min

T-AXIS

TEMP. RATE, °C/min 10

RANGE, °C/cm 50

FEAT. COOL 180

TEMP. °C 110

TIME, min/cm 35

IGA 50 µg/mv DTG 50 µg/(min mv)

EXPRESSION, ng 36.09

RANGE, mv/cm 1

WEIGHT, ng 37.98

TIME CONST., sec 1

gV 5

TMA 1 µg/mv DTM 0.1 µg/(min mv)

NAME

RANGE, mv/cm

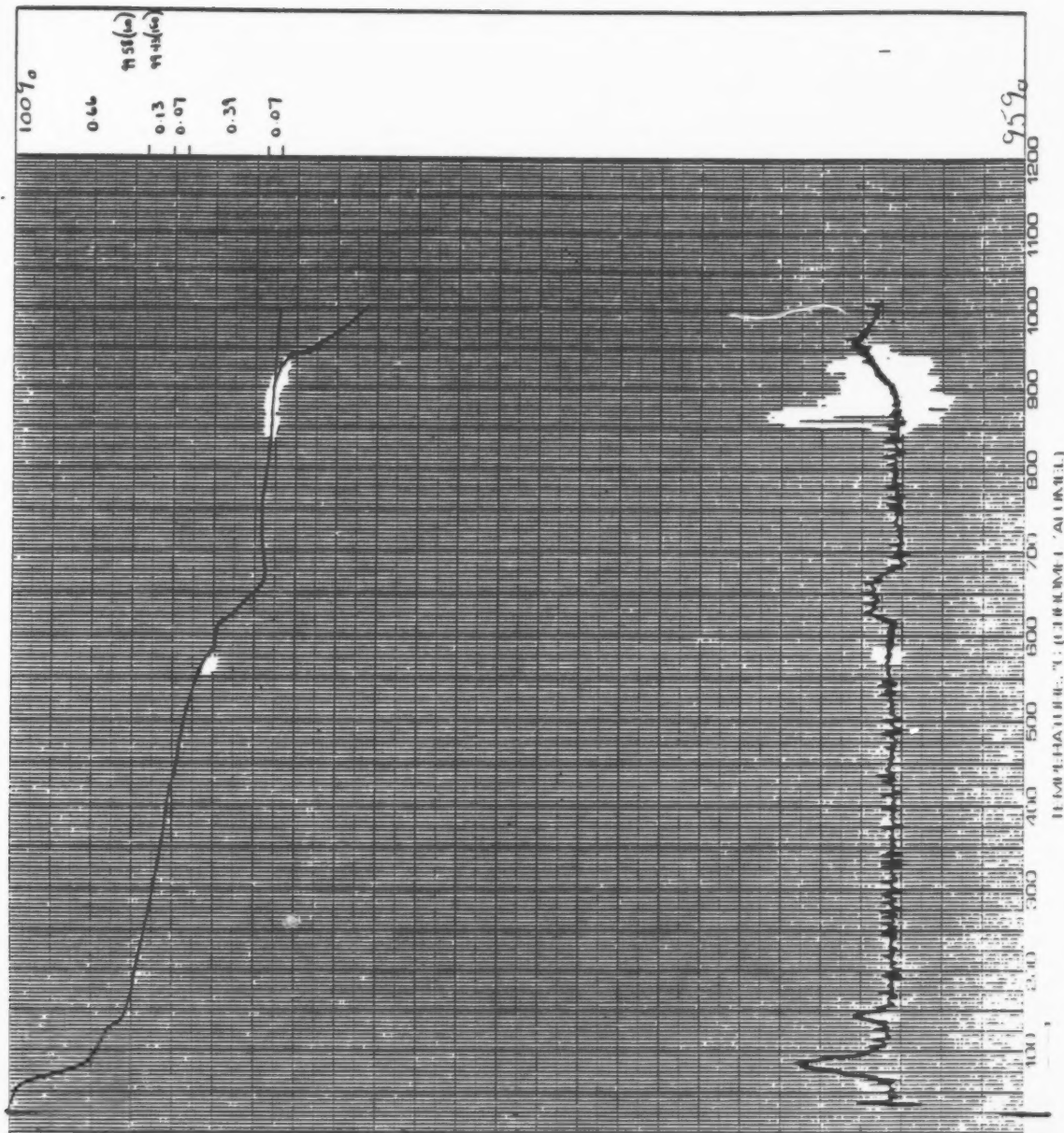
SAMPLE SIZE

LOAD, g

gV

Du Pont Instruments

MEASURED VARIABLE



PART NO. 990576

INSTRUMENT DATE 5/19/75

OPERATOR J.M.

SAMPLE 4000 (70) 5 M.

AIM AL

FLOW RATE 100 CC (min)

T-AXIS

TEMP RATE, °C/min 10

HANDEL, °C/cm 50

HEAT ☒ COOL ☐ 150

START, min 110

TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)

SETHRESHOLD, mg 30.15

HANDEL, mv/cm 1

WEIGHT, mg 31.73

TIME CONST, sec 1

dy -5

TMA 1 µm/mv DTM 0.1 µm/(min mv)

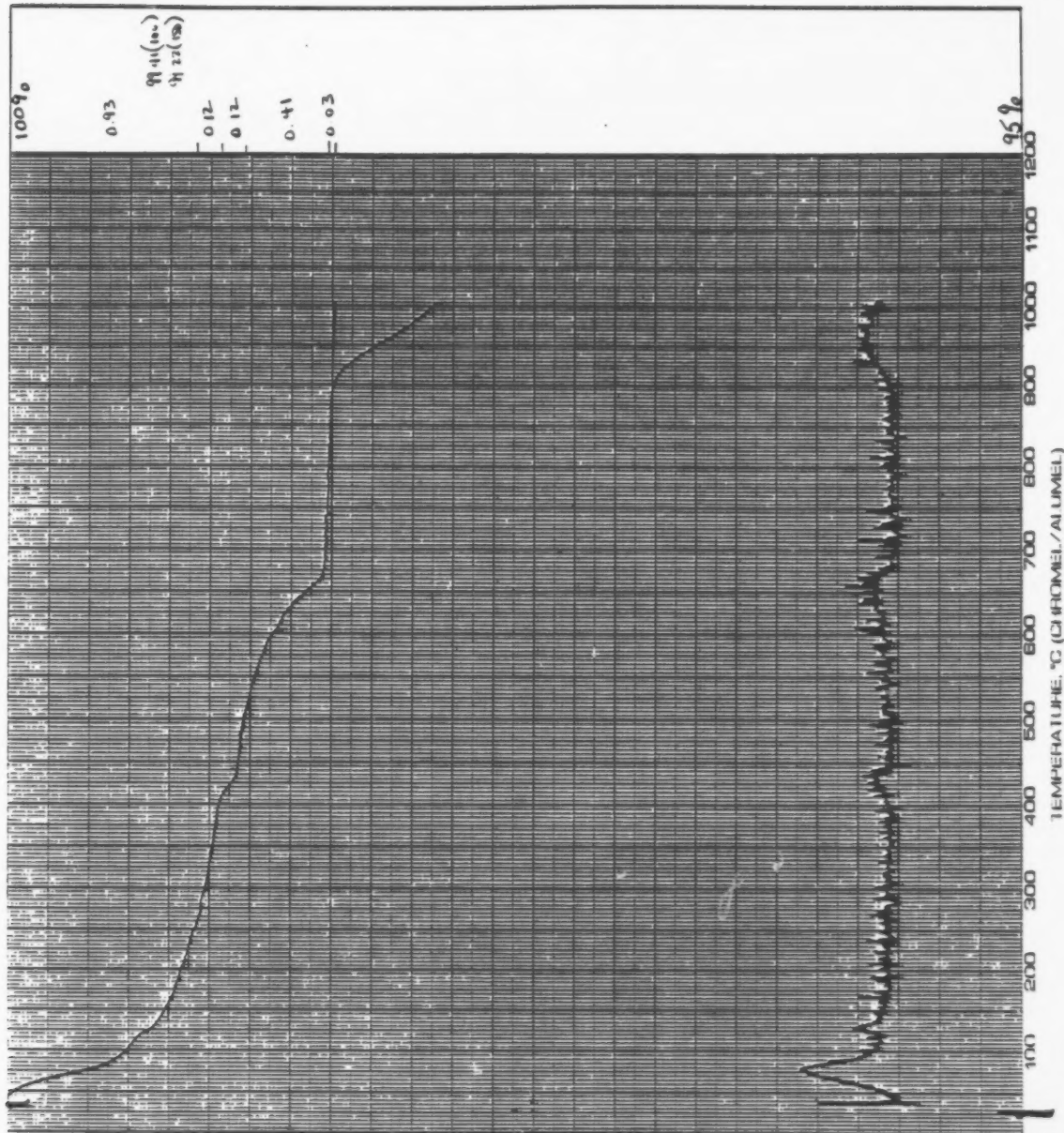
MODE

HANDEL, mv/cm

SAMPLE SIZE

LOAD, g

dy



DuPont Instruments

MEASURED VARIABLE LEFT-Y AXIS

PART NO. 990526

TURNED DATE JULY 9, 1995

INITIATOR 3.0

SAMPLE HURD (70214

AIM NL

FLOW RATE 1000/0014

T-AXIS

TEMP. RATE, °C/min 12

HANDEL, °C/min 50

HEAT COOL 180

SHUT, ON 110

TIME, min/cm .25

TGA 50 µg/mv DTG 50 µg/(min mv)

EXPRESSION, mv 37.11

HANDEL, mv/cm 5

WEIGHT, mv 42.21

TIME CONST, sec 1

WV 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)

NAME

HANDEL, mv/cm

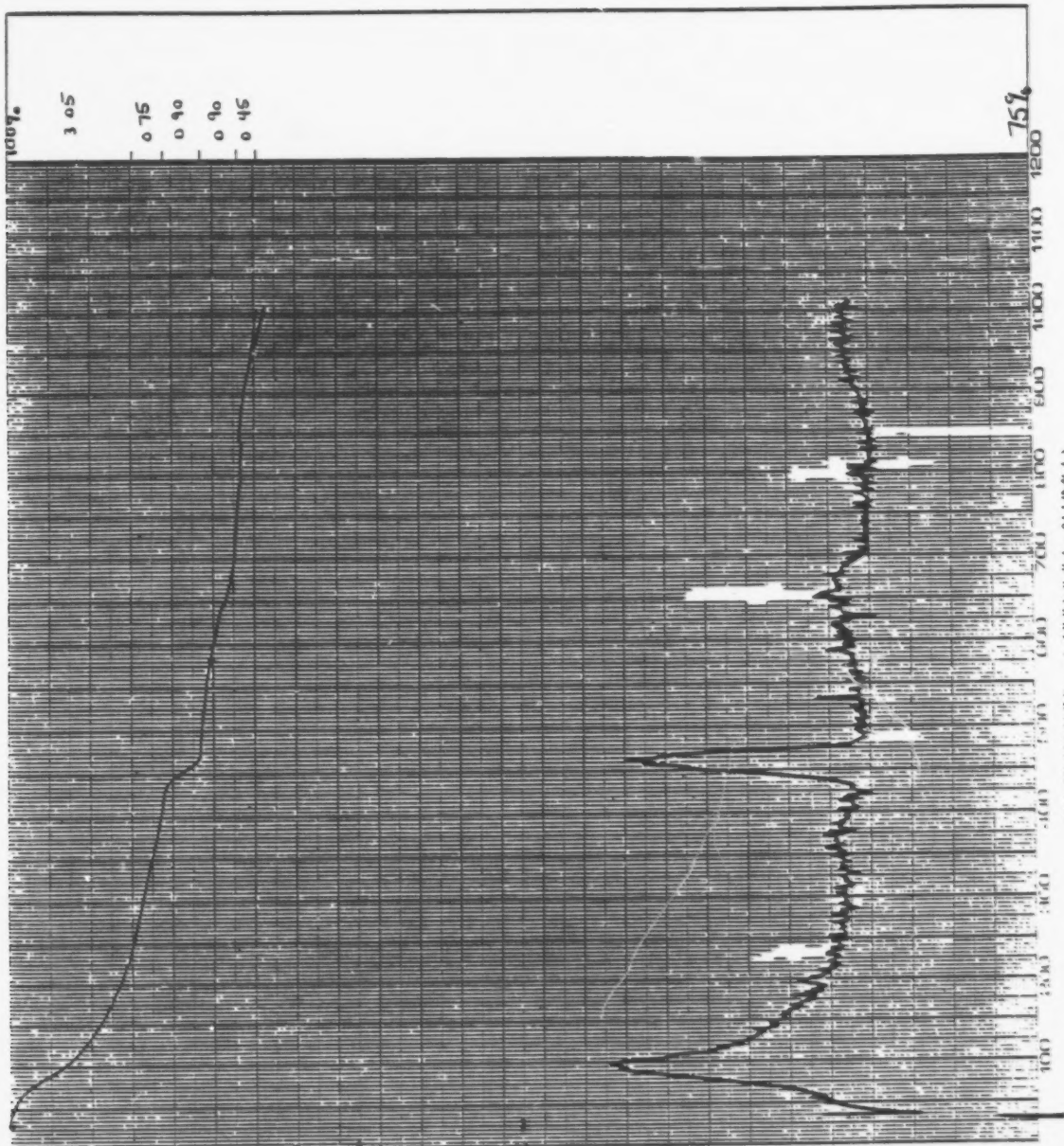
SAMPLE SIZE

LOAD, g

WV

Du Pont Instruments

MEASURED VARIABLE



WEIGHT LOSS (PERCENT - AT TIME)

PART NO. 990526

PRINTED DATE 3-26-70 JMS

INSTRUMENT T-10

SAMPLE 4700 (70) 3d

AIM NL

FLOW RATE 120 cc/min

T-AXIS

TEMP RATE, °C/min 10

TEMP, °C/min 50

HEAT ☒ CRR 150

START, min 310

TIME, min/cm .25

TGA 50 µg/mv DTG 50 µg/min (mv)

EXPRESSION, mg 26.26

FAIR, mv/cm 5

WEIGHT, mg 35.00

TIME CONST, sec 1

BY .5

TMA 1 µm/mv DTM 0.1 µm/min (mv)

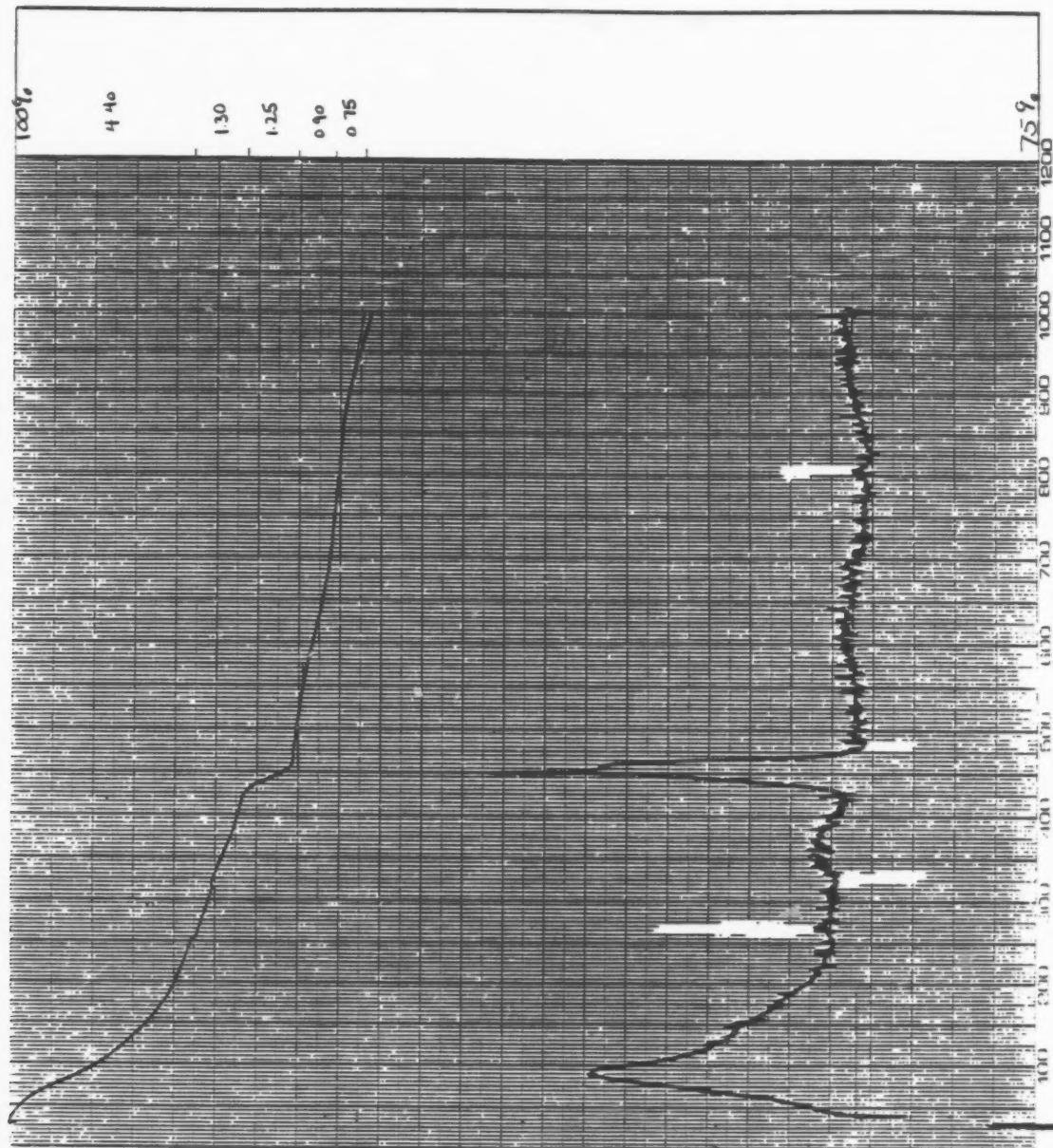
NAME

FAIR, mv/cm

SAMPLE SIZE

LOAD, lb

BY



TEMPERATURE (°C) (°F) (°C) (°F) (°C) (°F)

DuPont Instruments

MEASURED VARIABLE, DTC, Y, MMS

PART NO. 990526

TURN NO. DATE 10/17/1985

EXPLANATION 3 M

SAMPLE 1000 (70) 71

AIM NL

FLOW RATE 100 CC/min

T-AXIS

HEAT RATE, °C/min 10

HANDLE, °C/min 50

HEAT COOL 180

SHUT, min 110

TIME, min/min 25

TGA 50 µg/mv DTG 50 µg/min mv

EXPRESSION, mg 26.28

HANDLE, mv/min 5

WEIGHT, mg 35.16

TIME CONST., sec 1

BY 15

TMA 1 µm/mv DTM 0.1 µm/min mv

MODE

HANDLE, mv/min

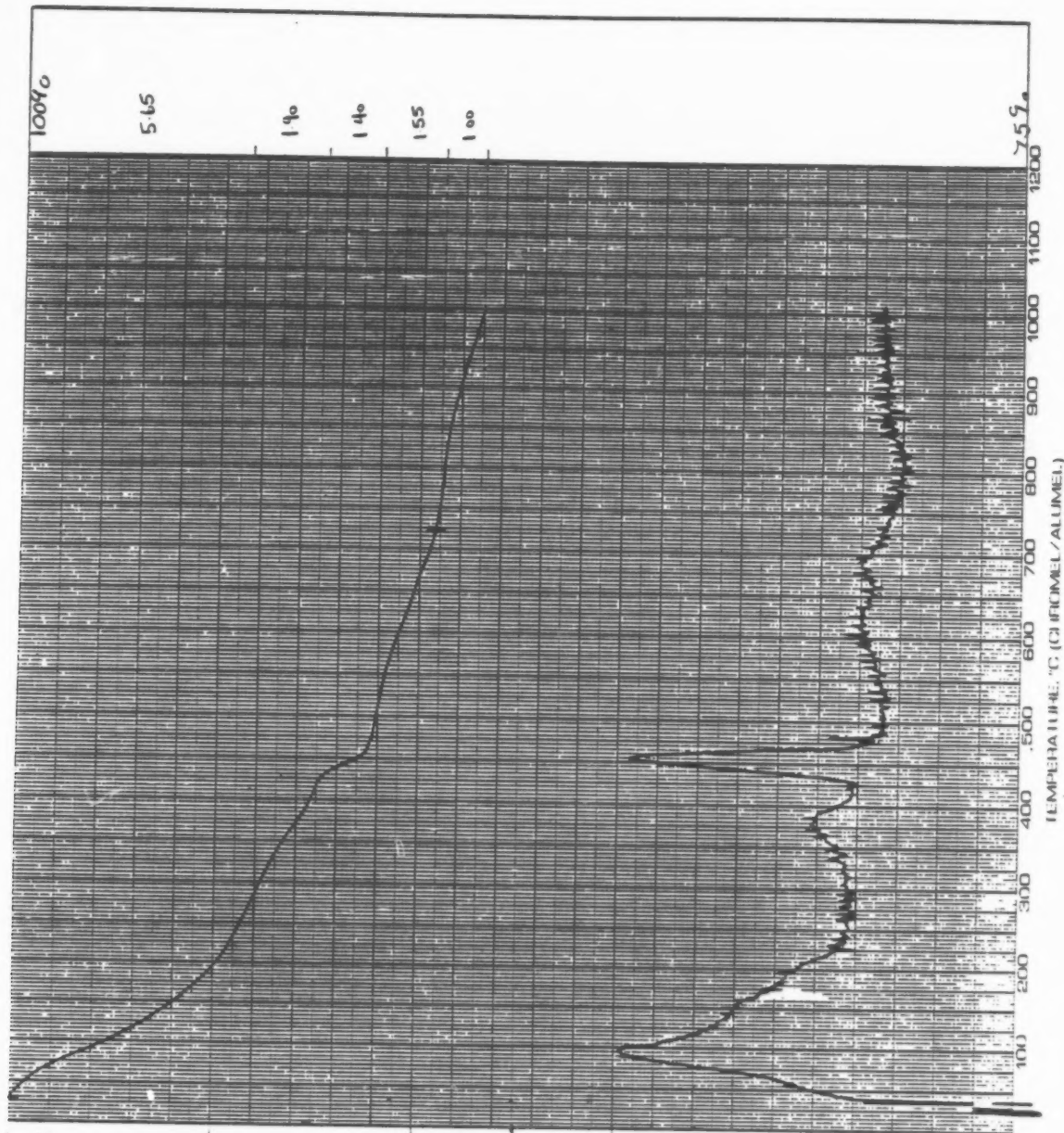
SAMPLE SIZE

LOAD, g

BY

DuPont Instruments

MEASURED VARIABLE



PART NO. 990526

FORM NO. DATE: June 16, 1965

OPERATOR J.M.

SAMPLE NO. 4080 (70) 281

ANAL. Ni

FLOW RATE 1000 ml/min

T-AXIS

TEMP. RATE, °C/min 10

HANDEL, °C/cm 50

HEAT ☒ CLK. ISO

SM. I, cm 110

TIME, min/cm .25

TGA 50 mV/mv DTG 50 mV/min mV

EXPRESSION, mg 39.86

HANDEL, mV/cm 5

WEIGHT, mg 41.22

TIME, CONST. sec 1

BY .5

TMA 1 mV/mv DTM 0.1 mV/min mV

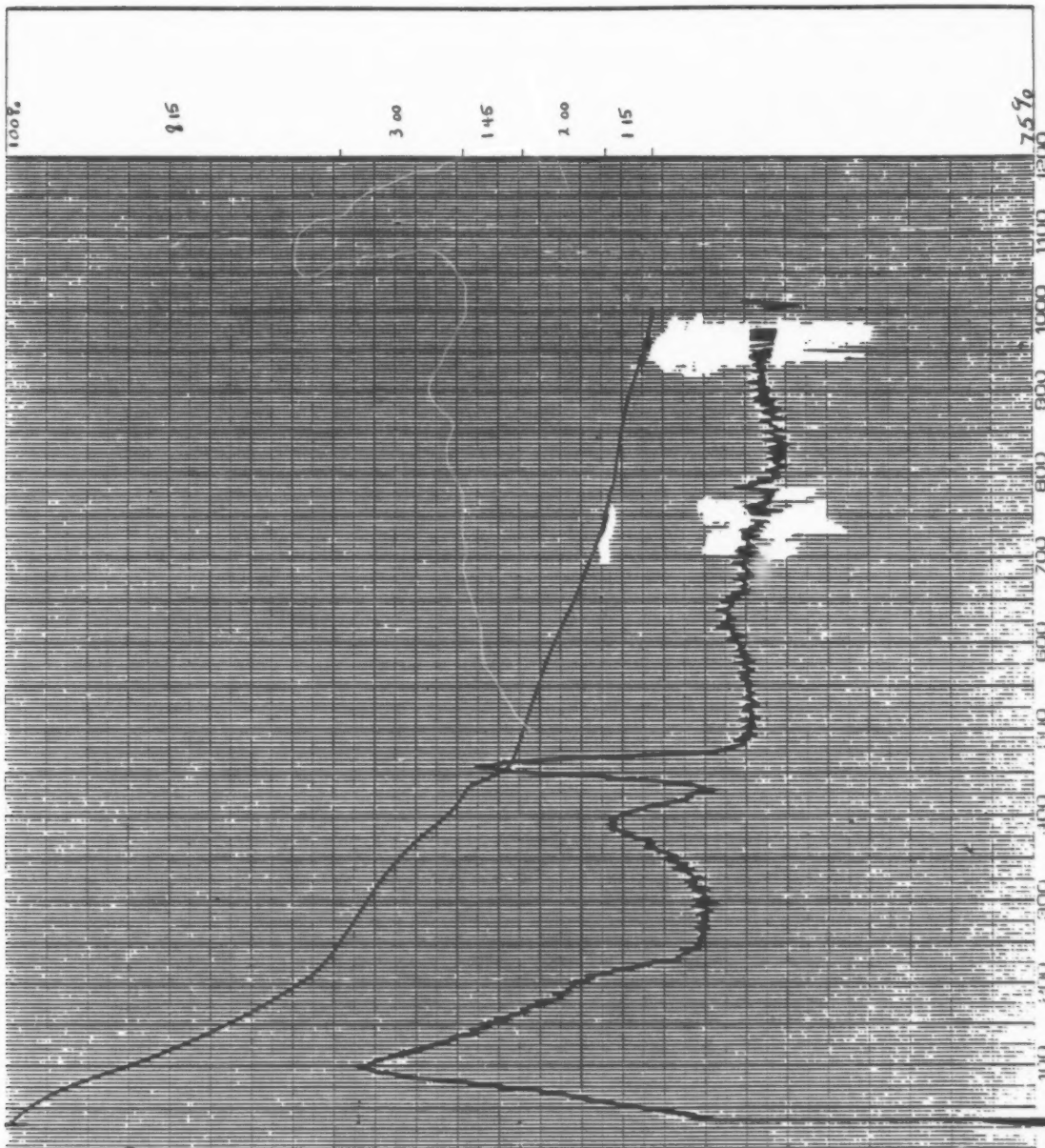
MARK

HANDEL, mV/cm

SAMPLE SIZE

INITIALS

BY



TEMPERATURE (°C)

PART NO. 990526

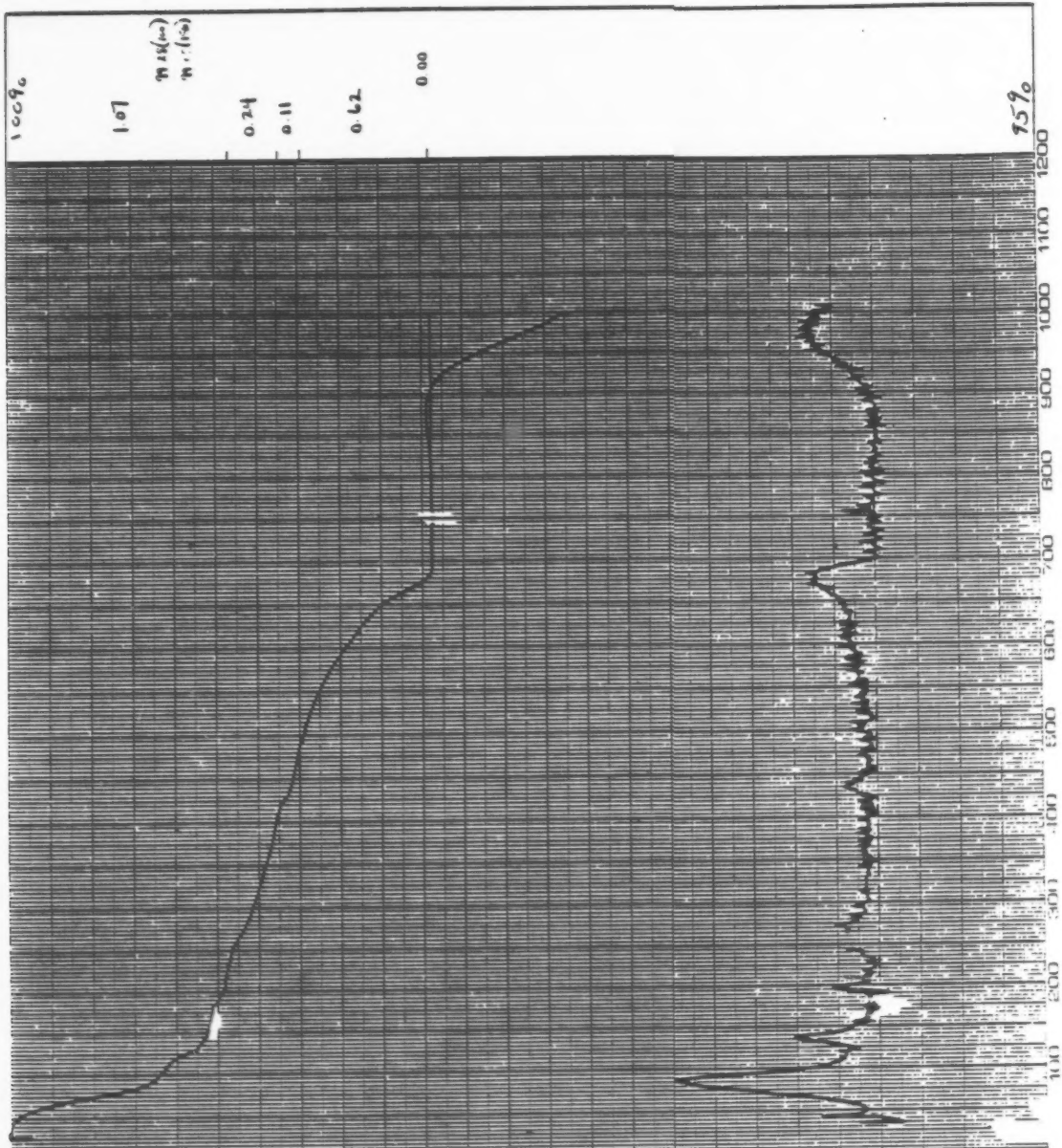
RUN NO. 3 DATE JULY 8, 1985
 INJECTION 3m
 SAMPLE 5000 (50) 2A
 AIM NL
 FLOW RATE 100 cc/min

T-AXIS

INJECTION RATE, $^{\circ}\text{C}/\text{min}$ 10
 RANGE, $^{\circ}\text{C}/\text{min}$ 50
 HEAT ☒ COOL 180
 SLOPE, $^{\circ}\text{C}/\text{min}$ 10
 TIME, min/cm 25

(IGA) 50 $\mu\text{g}/\text{mV}$ DTG 50 $\mu\text{g}/(\text{min mV})$
 SPLIT RATIO, mV 1/6.81
 RANGE, mV/cm 1
 WEIGHT, mg 44.26
 TIME CONST., sec 1
 μV .5

TMA 1 mm/mV DTM 0.1 $\mu\text{m}/(\text{min mV})$
 RANGE 1
 RANGE, mV/cm 1
 SAMPLE SIZE 1
 LOAD, g 1
 AD 1



TEMPERATURE (°C) vs. TIME (min)

PART NO. 990526

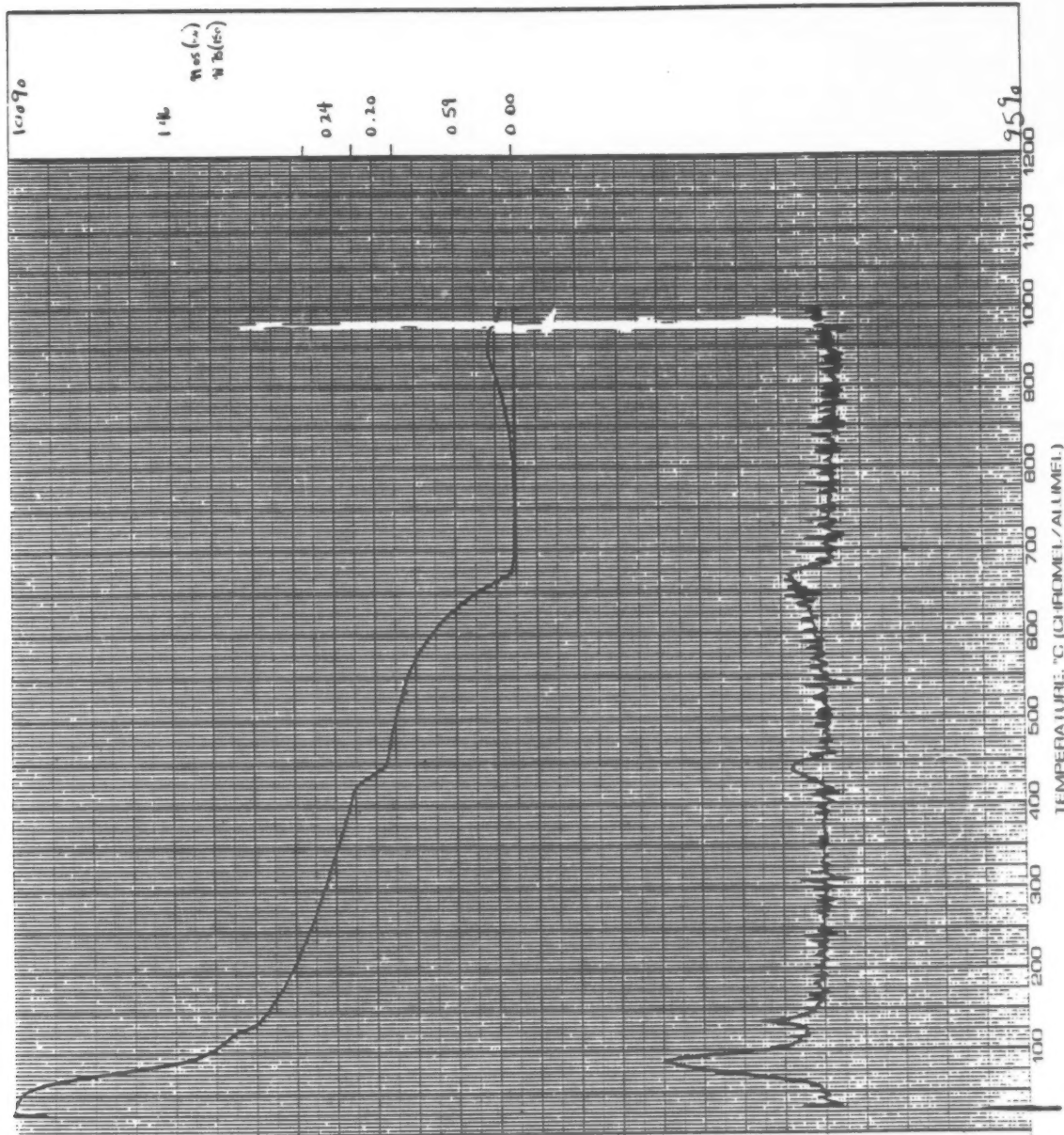
RUNNER DATE JULY 23/95
 OPERATOR SM
 SAMPLE 5000 (50) 5L
 ATM N₂
 FLOW RATE 100 cc/min

T-AXIS

HEAT RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT COOL ISO
 SAMPLE, cm 10
 TIME, min/cm 25

TGA 50 μ g/mV DTG 50 μ g/(min mV)
 EXPOSITION, mg 31.29
 RANGE, mV/cm 1
 WEIGHT, mg 32.94
 TIME CONST, sec 1
 dY 5

TMA 1 μ m/mV DTM 0.1 μ m/(min mV)
 RANGE, mV/cm
 SAMPLE SIZE
 LOAD, g
 dY



DuPont Instruments

MEASURED VARIABLE

PART NO. 990526

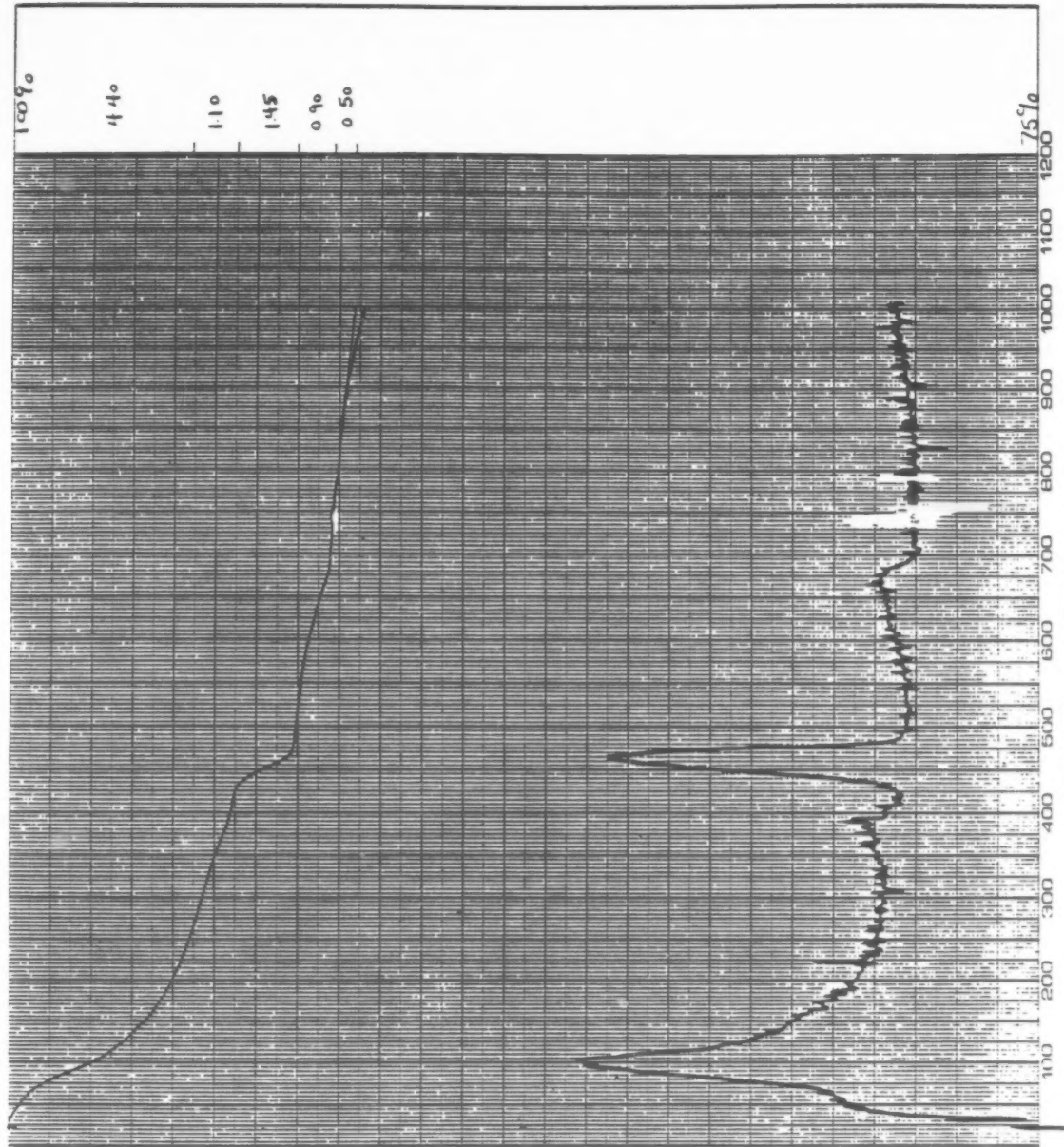
RUN IN: DATE 3/17/68
 OPERATOR: J.M.
 SAMPLE: 5000(50) 14
 AIM: N₂
 FLOW RATE: 100 cc/min

T-AXIS

FURNACE RATE: °C/min. 10
 FURNACE: °C/cm. 50
 HEAT: COOL. 180
 SAMPLE: cm. 10
 TIME: min/cm. 25

TGA 50 µg/mv. DTG 60 µg/min mv)
 SAMPLE WEIGHT, mg 29.38
 FURNACE, mv/cm 5
 WEIGHT, mg 29.16
 TIME CONST., sec 1
 DIV 1.5

TMA 1 µm/mv OTM 0.1 µm/min mv)
 MODE
 FURNACE, mv/cm
 SAMPLE SIZE
 LOAD, g
 DIV



TEMPERATURE, °C (CHROMEL/ALUMEL)

PART NO. 990526

IRUN NO. DATE JULY 23/85

ORIENTATION 3M

SAMPLE 5000(50) 24

ATM N₂

FLOW RATE 100cc/min

T-AXIS

HEAT RATE, °C/min 10

HANSE, °C/min 50

HEAT COOL ISO

SHUT, cm 10

TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)

SETHPRESSION, mg 22.51

HANSE, mv/cm 5

WEIGHT, mg 38.01

TIME CONST, sec 1

dy 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)

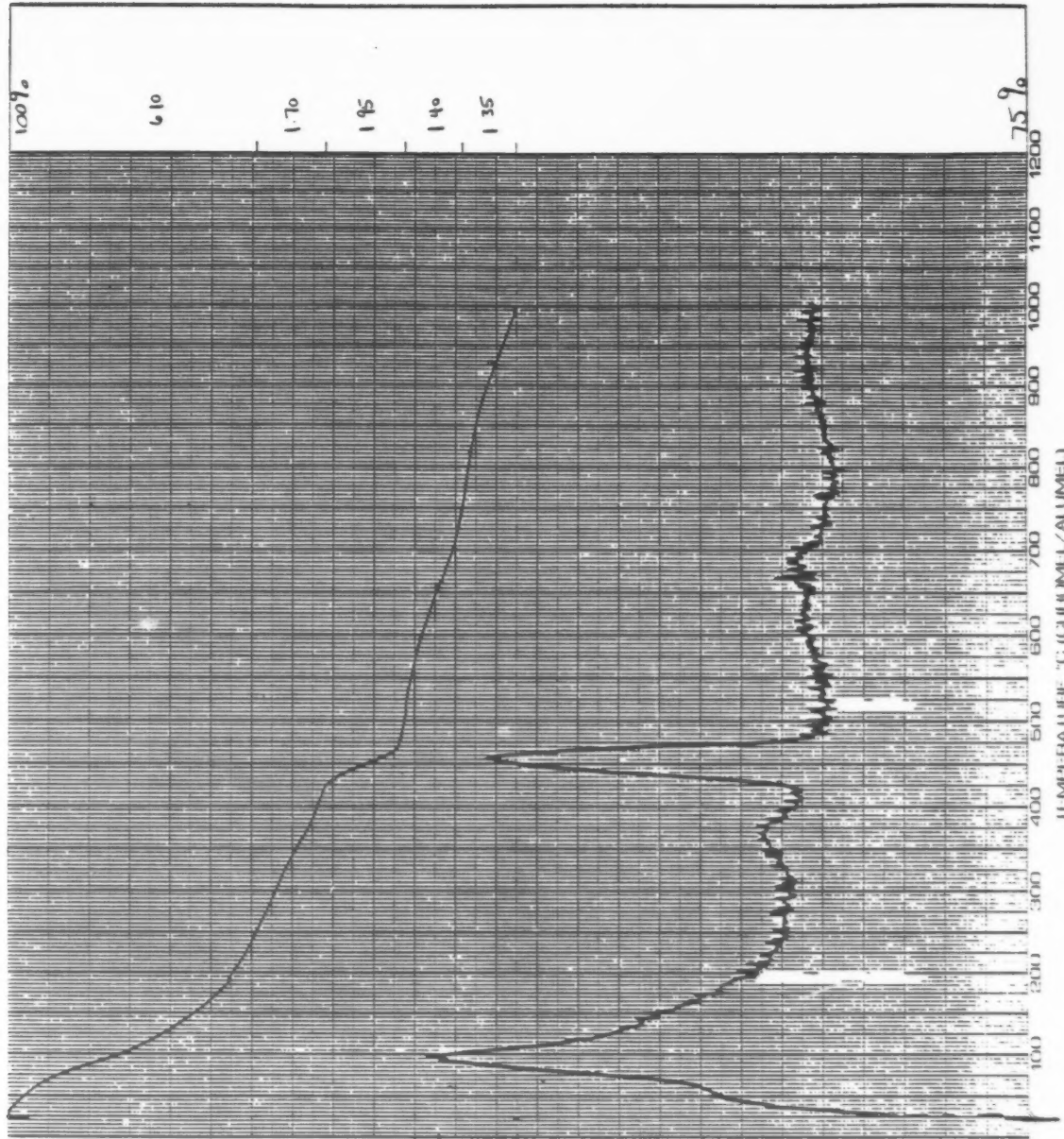
MODE

HANSE, mv/cm

SAMPLE SIZE

LOAD, g

dy



PART NO. 990526

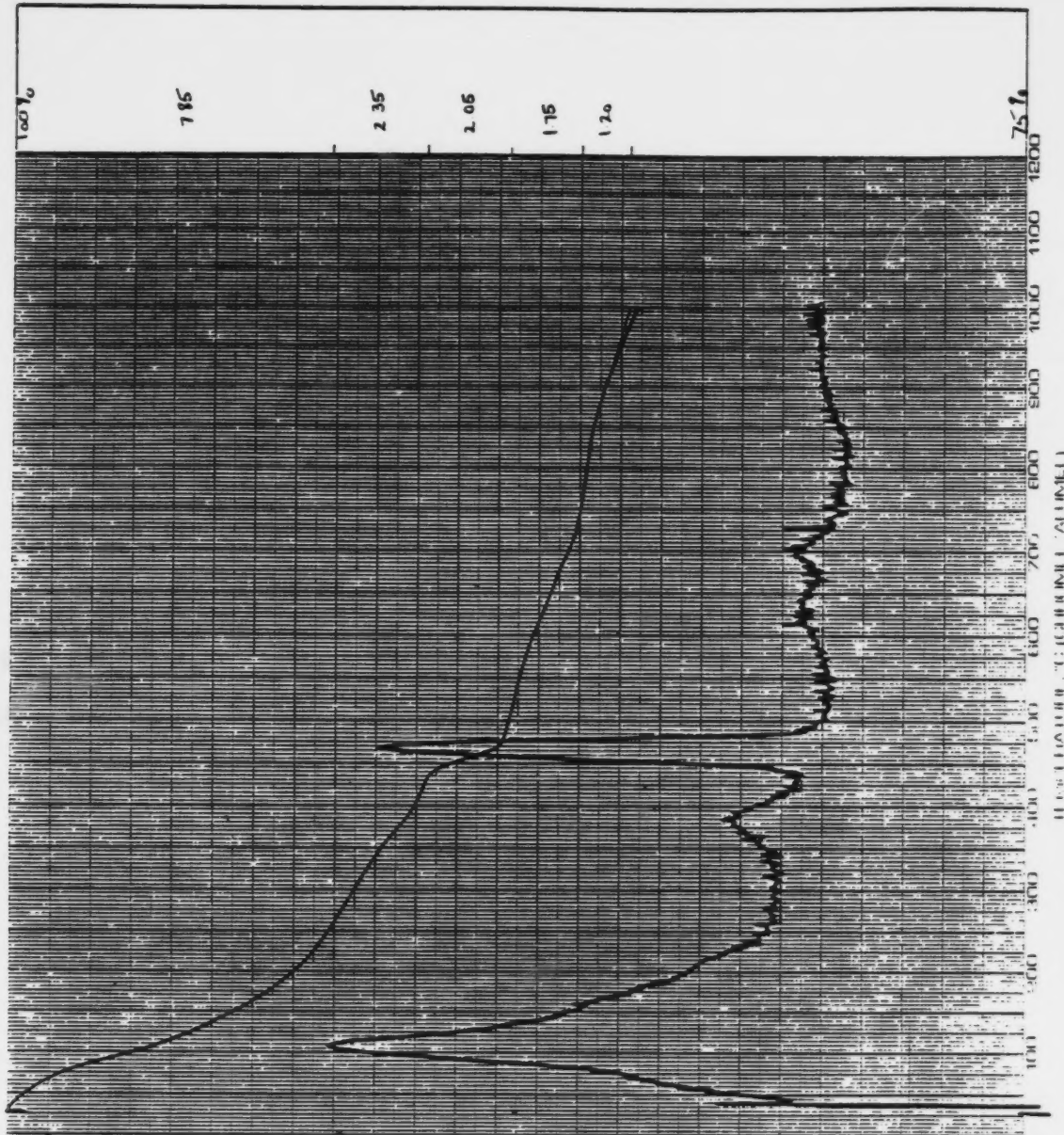
INSTRUMENT DATE 5 June 64
 OPERATOR J.M.
 SAMPLE 5059 (50) 74
 ATM N₂
 FLOW RATE 100 cc/min

T-AXIS

HEATING RATE, °C/min 10
 HEATING, °C/cm 50
 HEAT ☒ COOL ☐ ISO
 HEAT, °C .110
 TIME, min/cm .25

TGA 50 µg/mv DTG 50 µg/min (mv)
 DEPRESSION, mg 30.65
 HANG, mv/cm 5
 WEIGHT, mg 40.88
 TIME (CONST., sec) 1
 DIV 5

TMA 1 µm/mv DTM 0.1 µm/min (mv)
 HANG, mv/cm
 SAMPLE SIZE
 CATALYST
 DIV



TEMPERATURE (°C) 100 200 300 400 500 600 700 800 900 1000 1100 1200

PART NO. 990526

PRINTED DATE JULY 24/85

WEIGHT 5 gm

SAMPLE 5000 (50) 281

ATM N₂

FLOW RATE 100 cc/min

T-AXIS

HEAT RATE °C/min 10

RANGE °C/cm 50

HEAT °C/min 180

HEAT °C/min 110

TIME min/cm 25

TGA 50 µg/mv DTG 50 µg/min (mv)

EXPRESSION mg 33.99

RANGE mv/cm 5

WEIGHT mg 44.09

TIME CONST. sec 1

dy .5

TMA 1 µm/mv DTM 0.1 µm/min (mv)

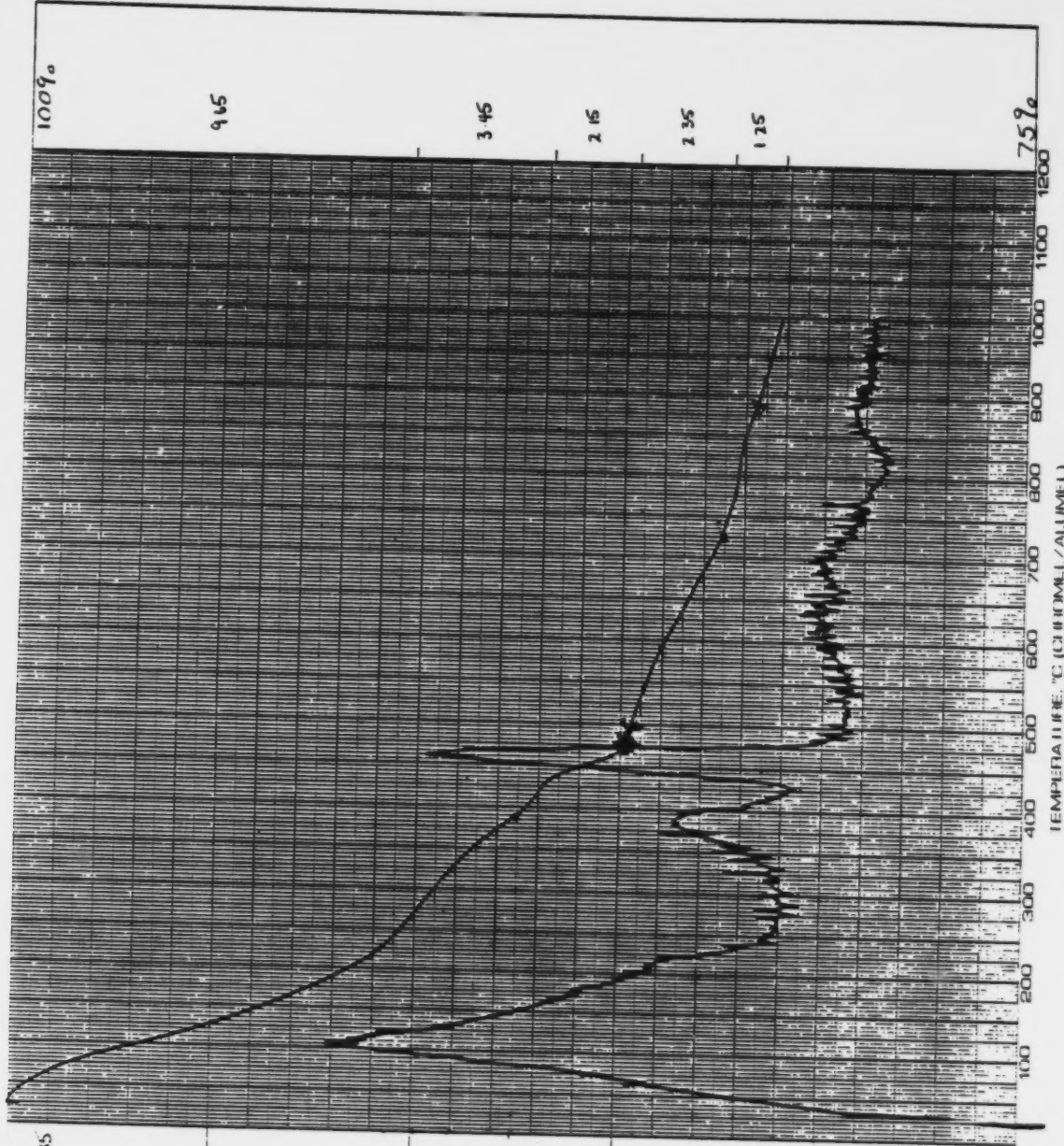
MODE

RANGE mv/cm

SAMPLE SIZE

LOAD g

dy



DuPont Instruments

MEASURED VARIABLE

PART NO. 990526

INSTR. DATE JULY 12, 1965

RECHARGE 3.0

SAMPLE 5000 (70) 2.6

AIM 10.5

FLOW RATE 1000 ml/min

T-AXIS

HEAT RATE, °C/min 1.0

HANSE, °C/cm 50

HEAT ☒ COOL 180

SEIT, cm 110

TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)

EXPRESSION, mg 42.02

HANSE, mv/cm 1

WEIGHT, mg 44.35

TIME CONST., sec 1

WY 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)

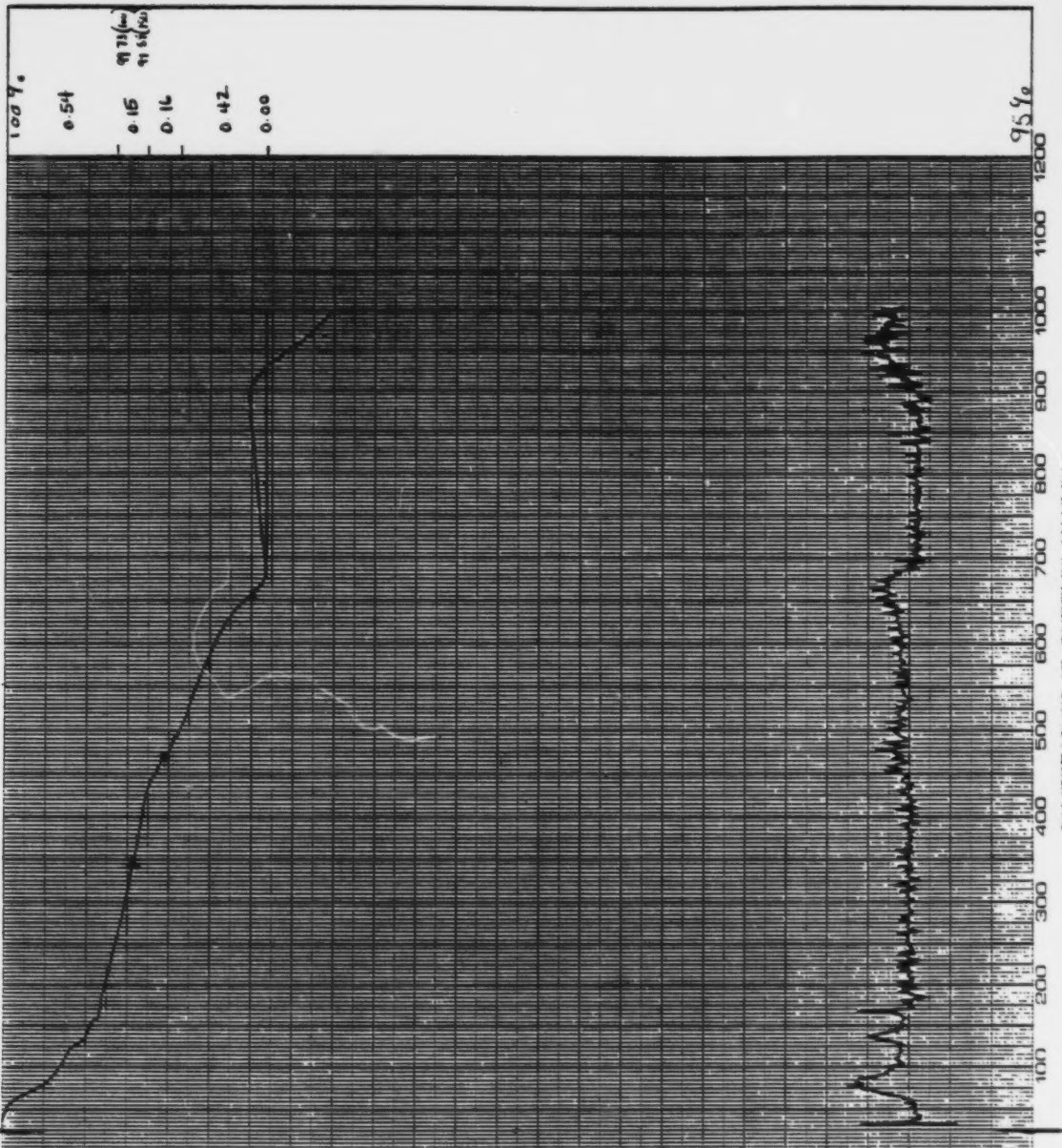
MODE

HANSE, mv/cm

SAMPLE SIZE

LOAD, g

WY



TEMPERATURE, °C (FROM 1 CALI ME-L)

95.4

Du Pont Instruments

MEASURED VARIABLE

PART NO. 990526

DATE Jan 2, 1962

INSTRUMENT

5000 (70) 5k

AIM N/L

INTERVAL 10000 (m.s.)

T-AXIS

PERCENTAGE 100

PERCENT 50

HEAT CHECK ISO

TEMP. 100

TIME 0.25

TGA 50 μ g/mv DTG 50 μ g/(mm mv)

STARTING POINT 31.95

PERCENT 1

WEIGHT 23.62

TIME 100

DTG 0.5

TMA 1 μ m/mv DTM 0.1 μ m/(mm mv)

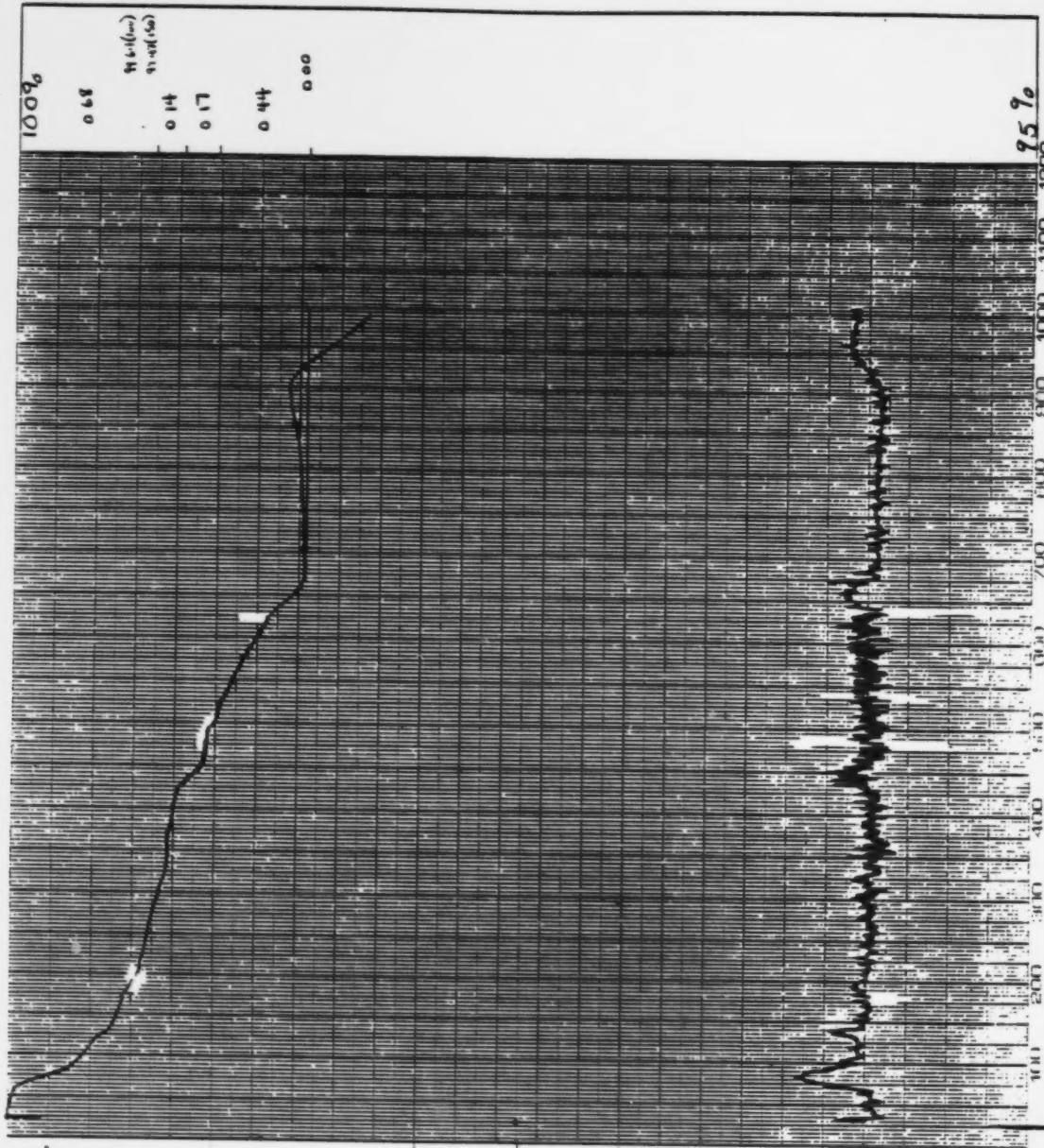
PERCENT

PERCENT 100

SAMPLE SIZE

LOAD 0

DTG



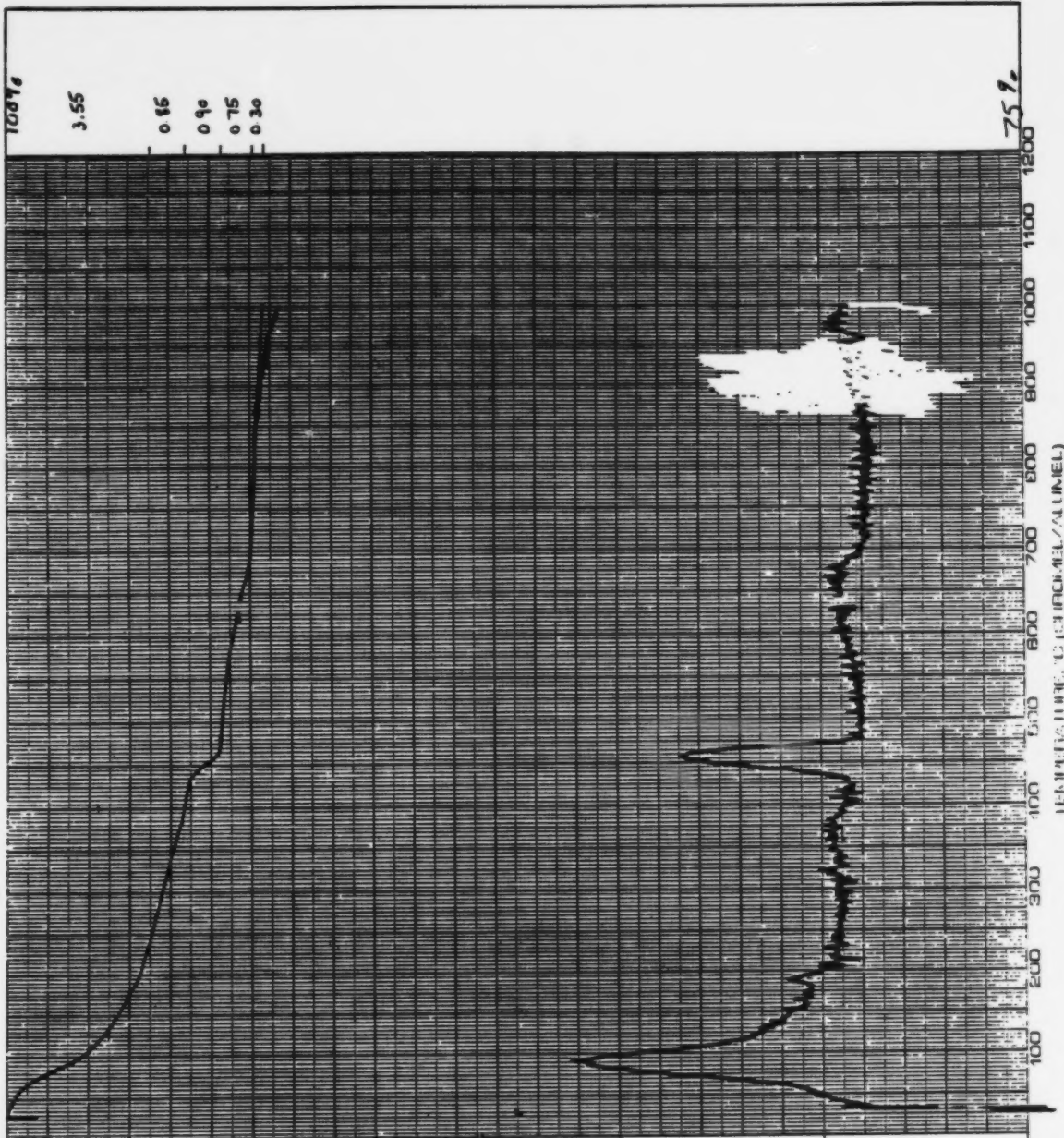
TEMPERATURE (°C)

PART NO. 990526

RUN NO. _____ DATE JUNE 28 1965
 OPERATOR S.M.
 SAMPLE 5000 (70) 1A
 ATM N₂
 FLOW RATE 100 cc/min
 T-AXIS
 PROG. RATE: °C/min 10
 RANGE: °C/cm 50
 HEAT ☒ COOL 180
 SH-FT. cm ±10
 TIME, min/cm 25

TGA 50 µg/mV DTG 50 µg/(min mV)
 SUPPRESSION, mg 27.89
 RANGE, mV/cm 5
 WEIGHT, mg 37.14
 TIME CONST., sec 1
 dY 5

TMA 1 µm/mV DTM 0.1 µm/(min mV)
 MODE _____
 RANGE, mV/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



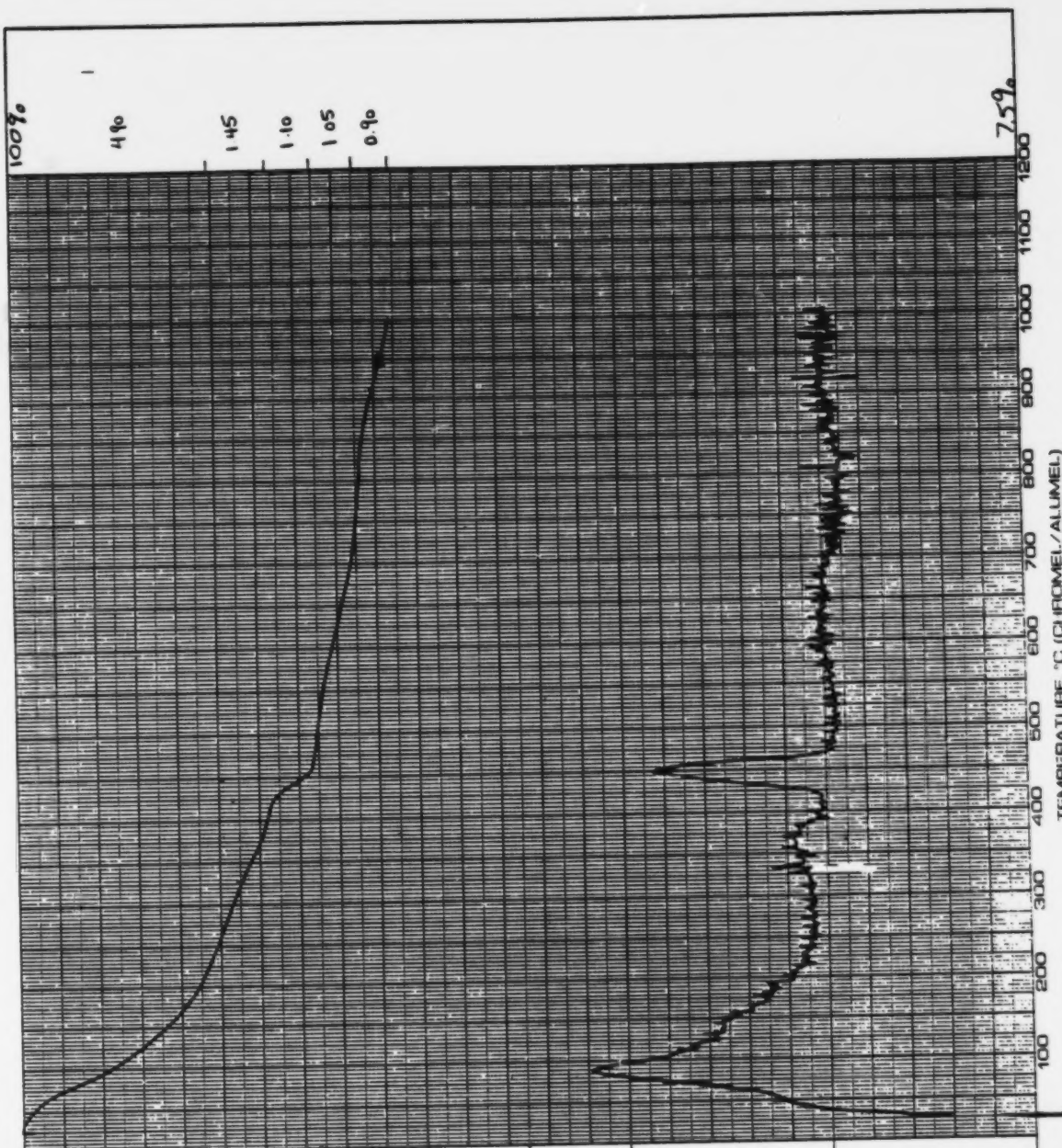
PART NO. 990526

RUN NO. _____ DATE JULY 26 1965
 OPERATOR 1.00
 SAMPLE 5000 (70) 3A
 ATM N₂
 FLOW RATE 100 cc/min

T-AXIS
 PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SH-IFT, cm +10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mg 23.67
 RANGE, mv/cm 5
 WEIGHT, mg 31.54
 TIME CONST., sec 1
 dY 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



759

PART NO. 990526

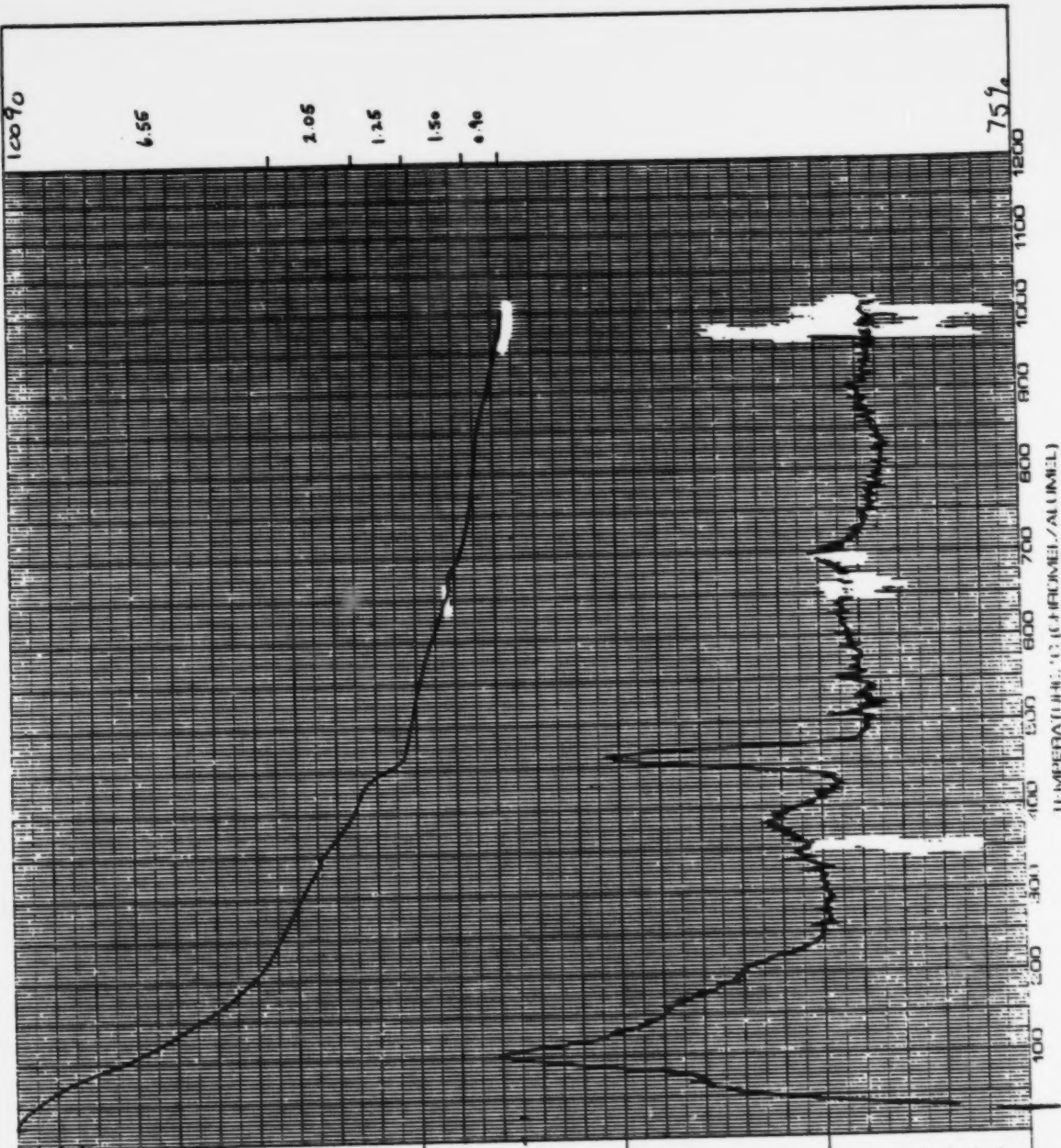
RUN NO. _____ DATE JULY 11, 1985
 OPERATOR S.M.
 SAMPLE 5000 (-70) 7A
 ATM d1
 FLOW RATE 180 cc/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SHIFT, cm +10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mg 31.73
 RANGE, mv/cm 5
 WEIGHT, mg 42.27
 TIME CONST., sec 1
 dY _____

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



PART NO. 990526

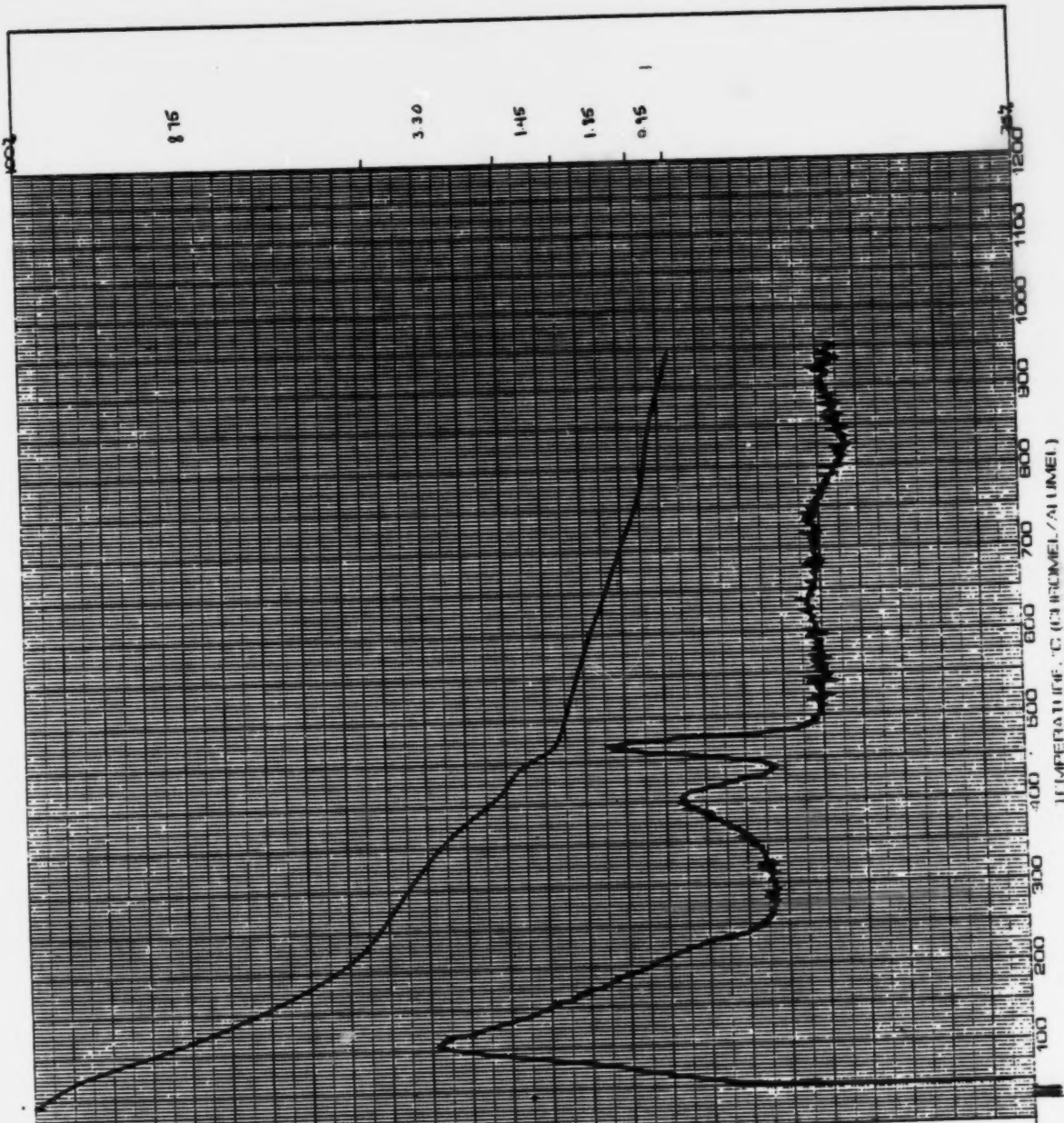
RUN NO. _____ DATE June 24 66
 OPERATOR Stromach
 SAMPLE 5000 (30) 28-A
 ATM 4
 FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ✓ COOL 180
 SHIFT, cm ±10
 TIME, min/cm 25

IGA 50 µg/mV DTG 50 µg/(min mV)
 SUPPRESSION, mg 20-32
 RANGE, mV/cm 5
 WEIGHT, mg 37.36
 TIME CONST., sec 1
 dY 2.5

TMA 1 µm/mV DTM 0.1 µm/(min mV)
 MODE _____
 RANGE, mV/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



DuPont Instruments

MEASURED VARIABLE AT DTG & TMA

PART NO. 990524

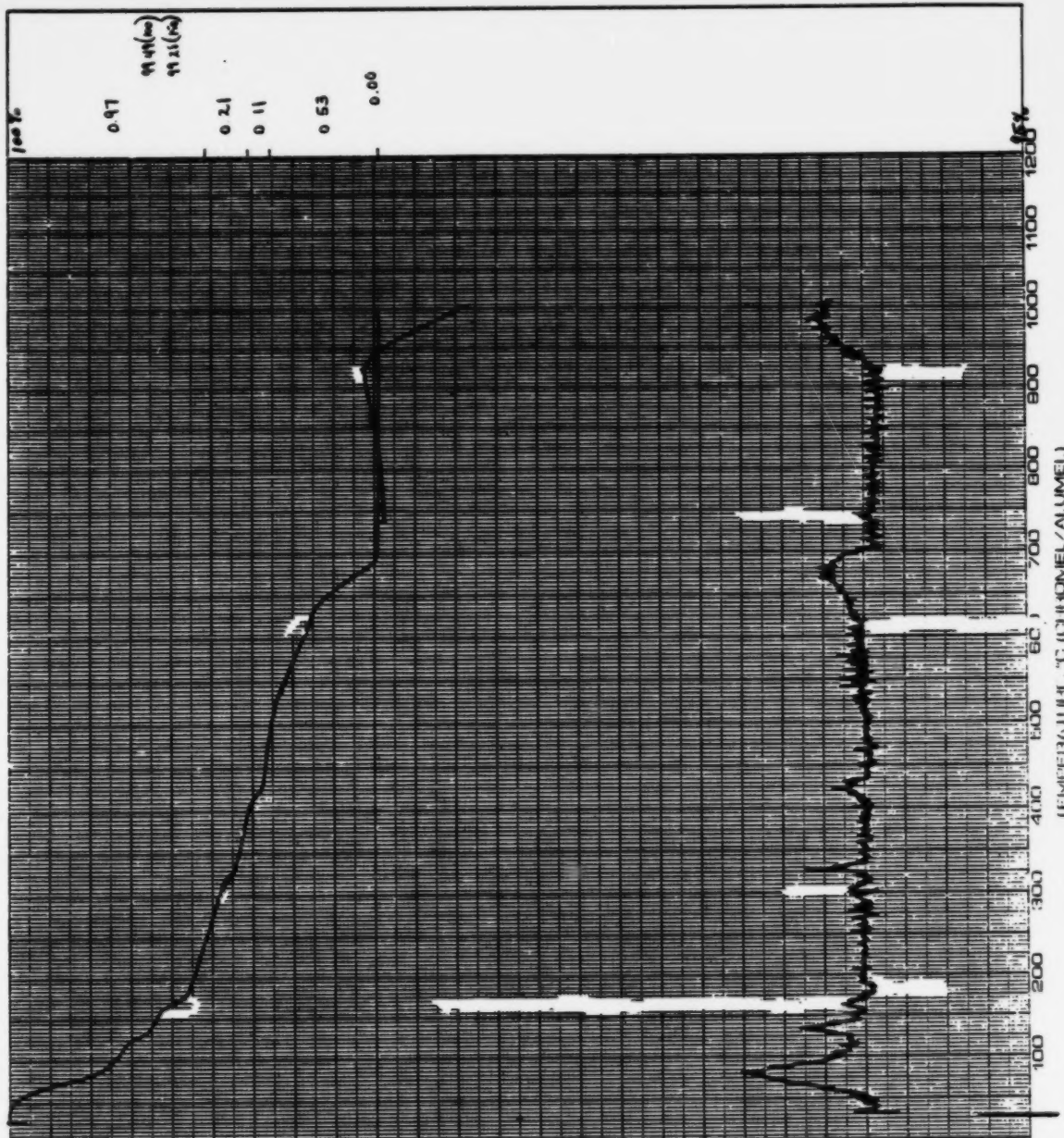
RUN NO. _____ DATE JUNE 27
 OPERATOR JM
 SAMPLE 6000 (50) 26
 ATM N₂
 FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SHIFT, cm +10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mg 41.55
 RANGE, mv/cm 1
 WEIGHT, mg 43.64
 TIME CONST., sec 1
 dY .5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



PART NO. 990526

RUN NO. _____ DATE JULY 17, 1975

OPERATOR S.M.

SAMPLE 6000 (50) 51

ATM N₂

FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10

RANGE, °C/cm 50

HEAT ☒ COOL 180

SHIFT, cm ±10

TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)

SUPPRESSION, mg 33.74

RANGE, mv/cm 1

WEIGHT, mg 35.53

TIME CONST., sec 1

dY 5

TMA 1 µm/mv OTM 0.1 µm/(min mv)

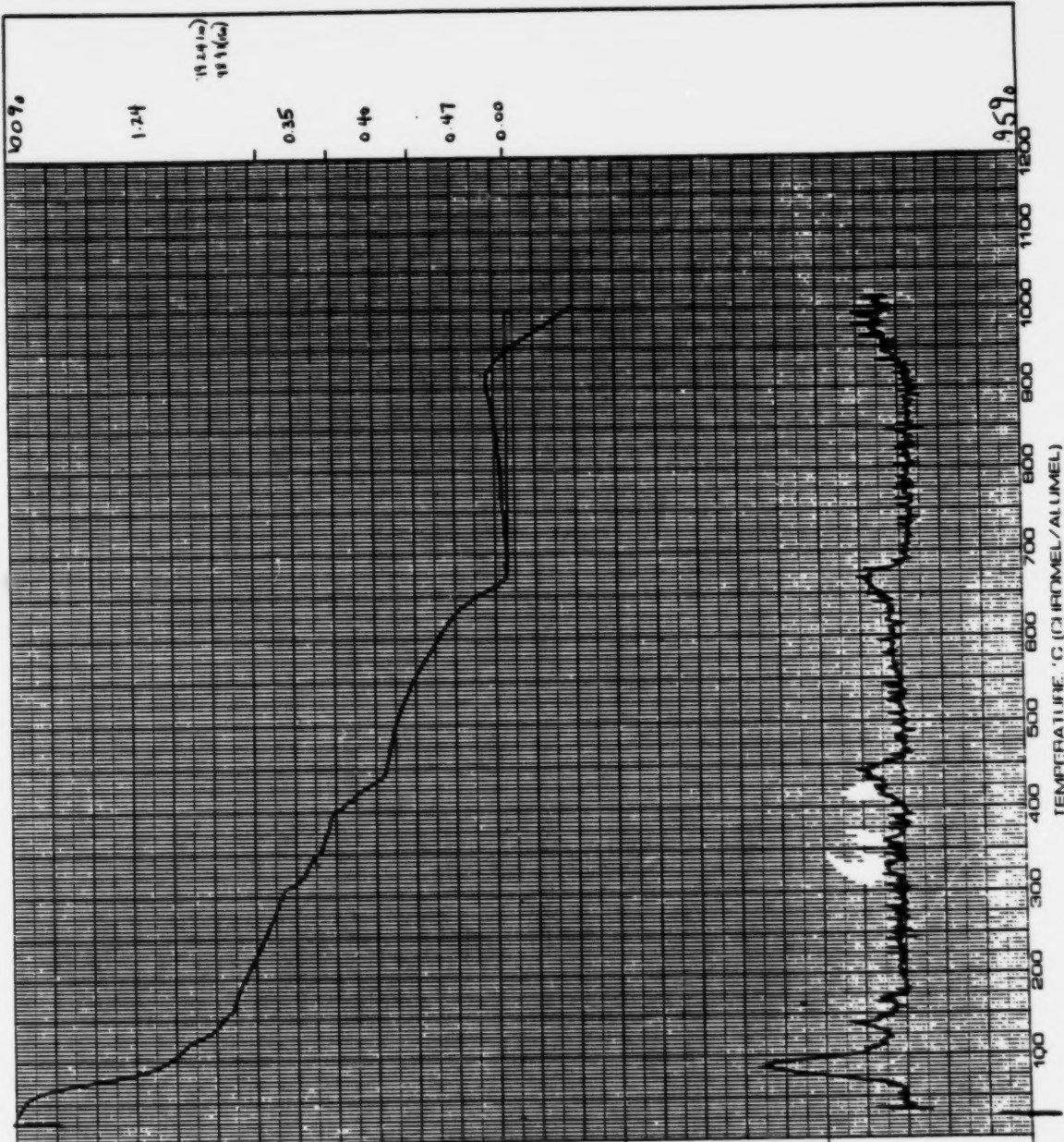
MODE _____

RANGE, mv/cm _____

SAMPLE SIZE _____

LOAD, g _____

dY _____



DuPont Instruments

MEASURED VARIABLE

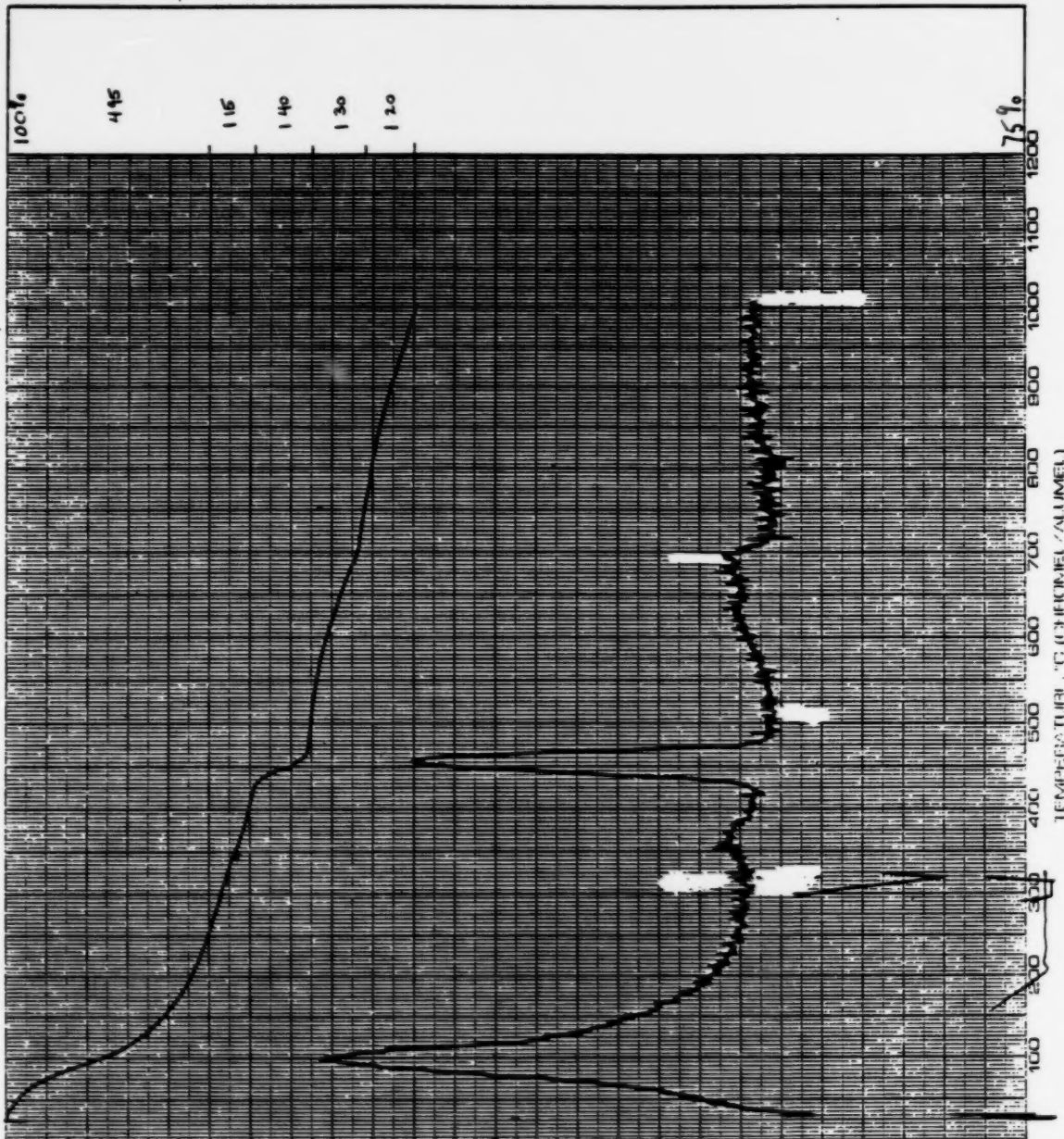
PART NO. 990326

RUN NO. DATE JUL 17/85
 OPERATOR SM
 SAMPLE 6000 (502) 1A
 ATM HL
 FLOW RATE 100 cc/min

T-AXIS
 PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SHIFT, cm ±10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mg 33.54
 RANGE, mv/cm 5
 WEIGHT, mg 44.70
 TIME CONST., sec 1
 dY .5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



TEMPERATURE, °C (DIFFERENTIAL THERMAL ANALYSIS)

PART NO. 990326

RUN NO. _____ DATE JULY 3, 1965
 OPERATOR S.M.
 SAMPLE 6000 (50) 3A
 ATM N₂
 FLOW RATE 100 cc/min

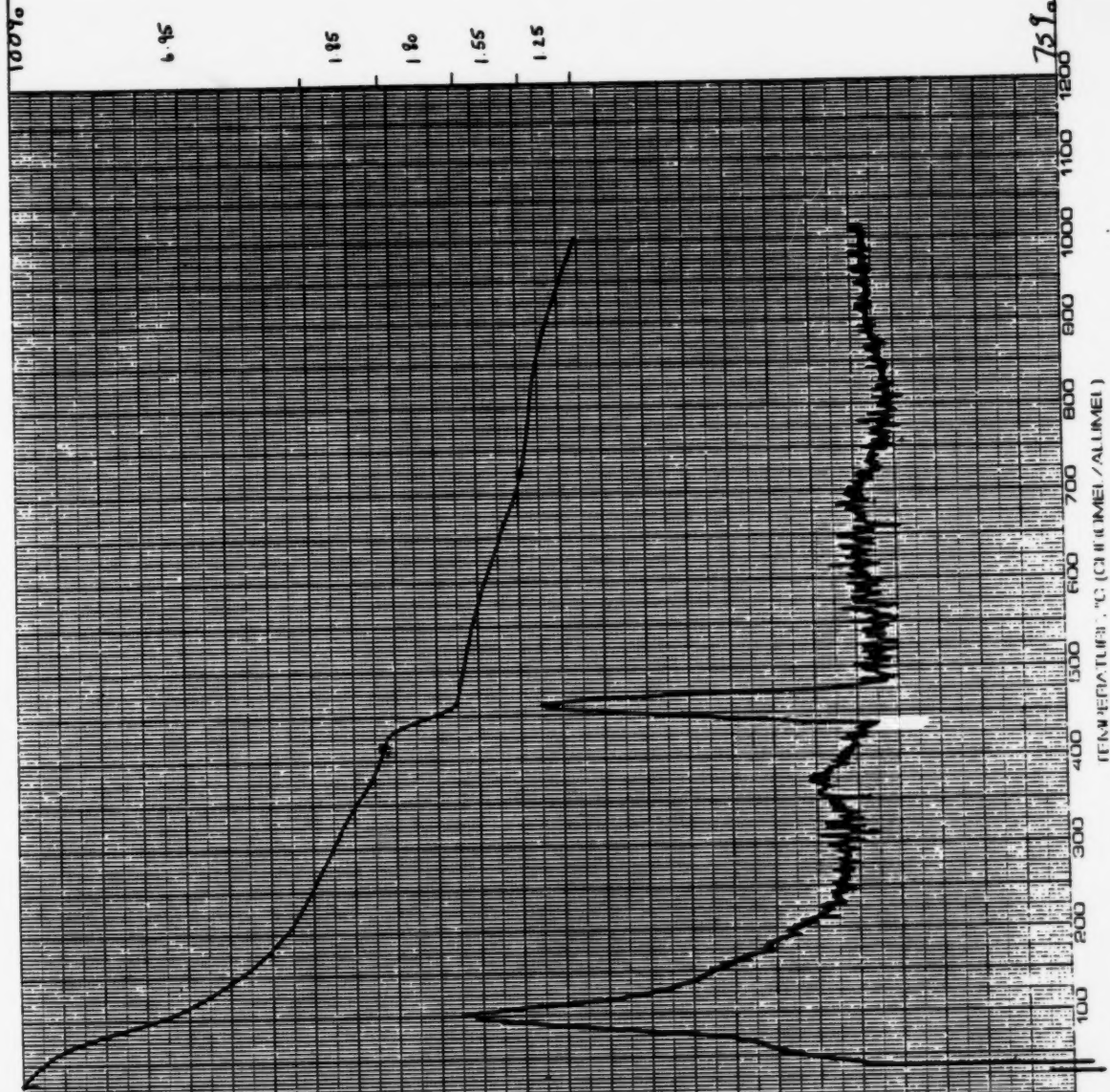
T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SHIFT, cm ±10
 TIME, min/cm .25

TGA 50 µg/mV DTG 50 µg/(min mV)
 SUPPRESSION, mg 24.77
 RANGE, mV/cm 5
 WEIGHT, mg 32.97
 TIME CONST., sec 1
 dY .5

TMA 1 µm/mV DTM 0.1 µm/(min mV)

MODE _____
 RANGE, mV/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



PART NO. 990526

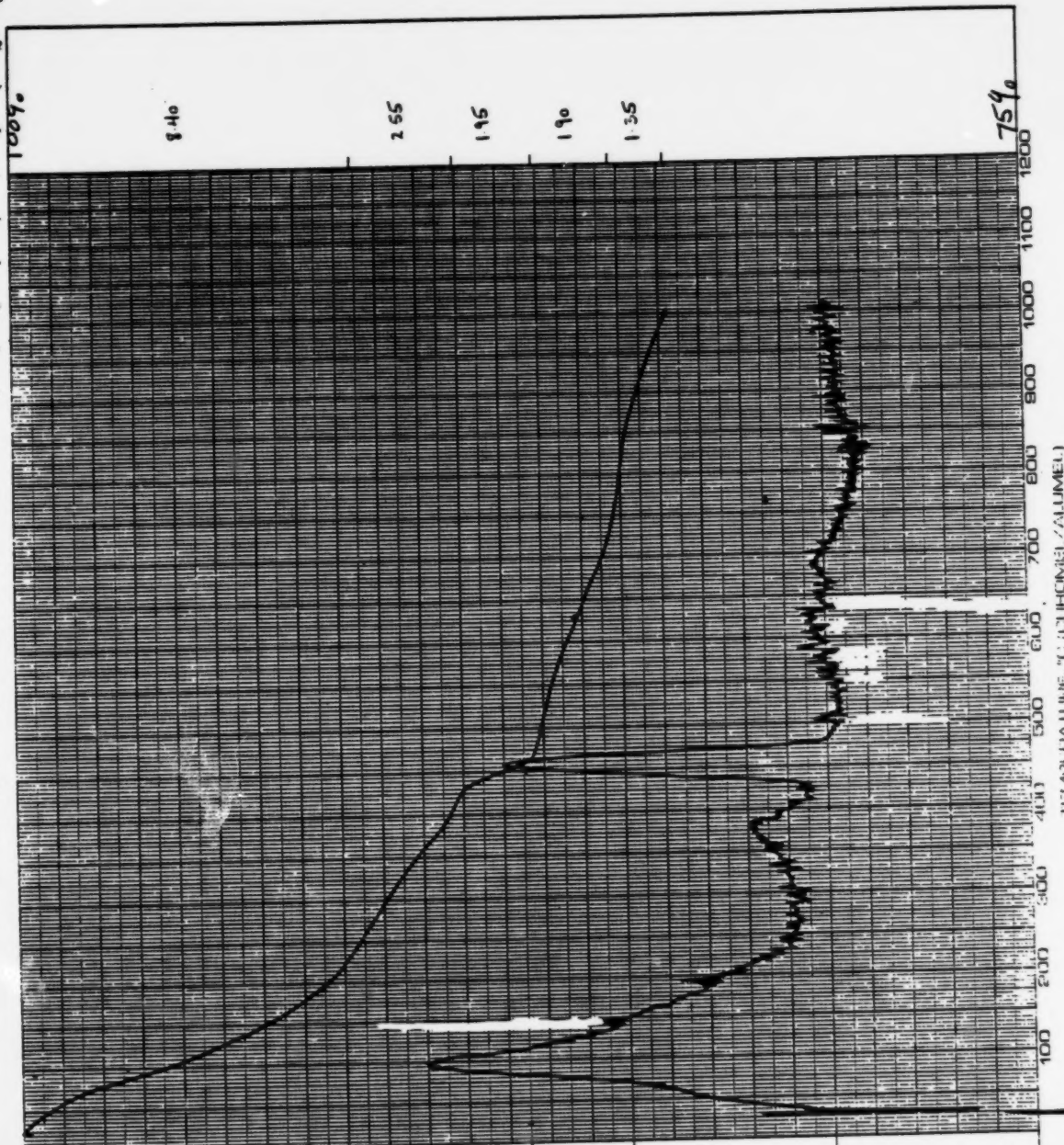
RUN NO. _____ DATE JULY 4, 1985
 OPERATOR JM
 SAMPLE 6000 (50) 71
 ATM N₂
 FLOW RATE 100 CC/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SHIFT, cm +10
 TIME, min/cm 25

TGA 50 µg/mV DTG 50 µg/(min mV)
 SUPPRESSION, mg 25.51
 RANGE, mV/cm 5
 WEIGHT, mg 35.32
 TIME CONST., sec 1
 dY 5

TMA 1 µm/mV DTM 0.1 µm/(min mV)
 MODE _____
 RANGE, mV/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



TEMPERATURE, °C (THERMOCOUPLER)

PART NO. 990326

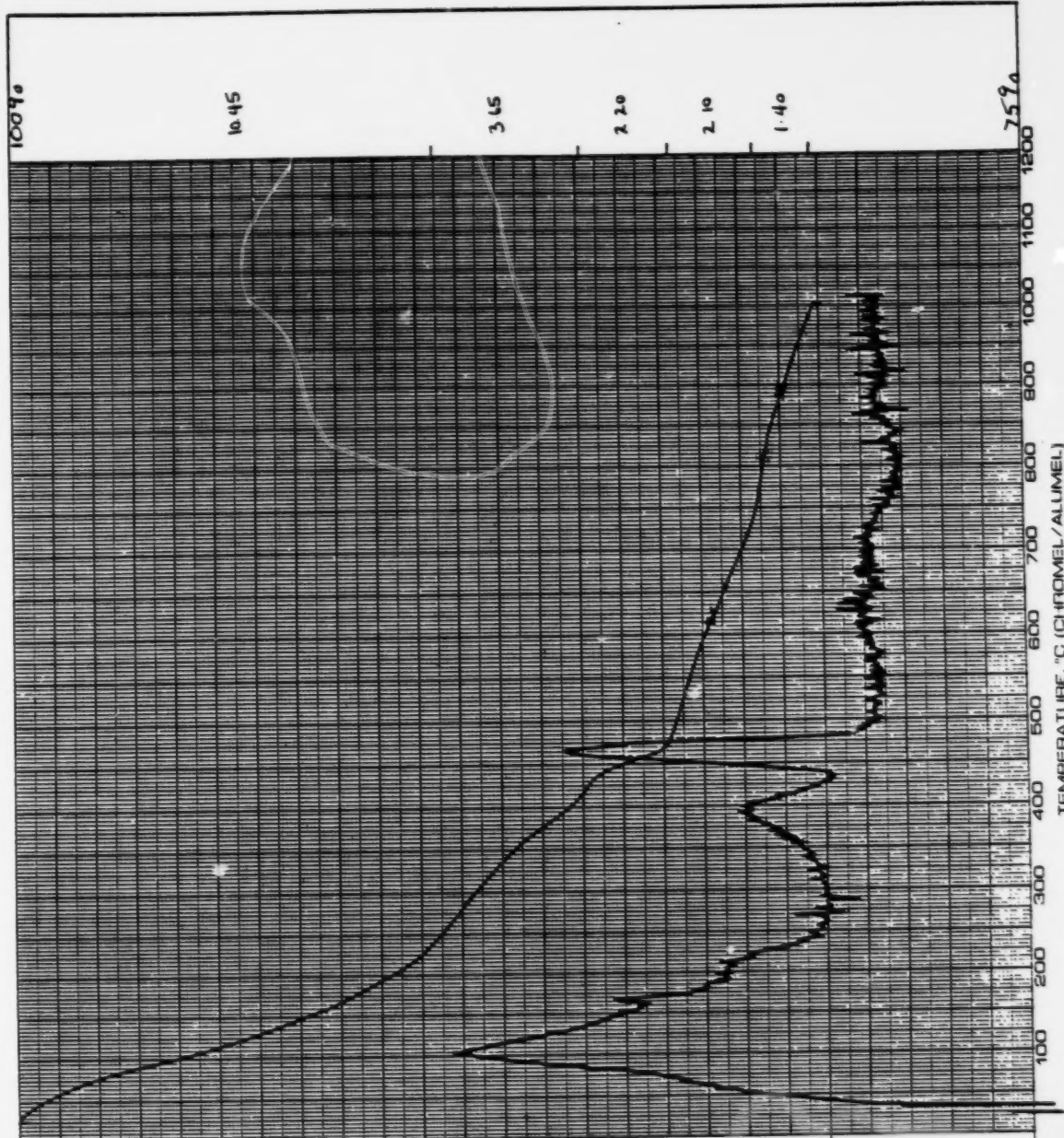
RUN NO. _____ DATE JULY 16, 1985
 OPERATOR S.M.
 SAMPLE COOL (50) 28 A
 ATM N₂
 FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ✓ COOL — ISO —
 SIFT, cm ±10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mg 23.97
 RANGE, mv/cm 5
 WEIGHT, mg 32.01
 TIME CONST., sec 1
 dY .5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



PART NO. 990526

RUN NO. _____ DATE July 22 65

OPERATOR S. H. HARRISON

SAMPLE 6000 (30) 21

ATM N₂

FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10

RANGE, °C/cm 50

HEAT ☒ COOL ☐ ISO ☐

SHIFT, cm +10

TIME, min/cm 25

TGA 50 µg/mV DTG 50 µg/(min mV)

SUPPRESSION, mg 42.96

RANGE, mV/cm 1.0

WEIGHT, mg 45.19

TIME CONST., sec 1

dY 0.5

TMA 1 µm/mV DTM 0.1 µm/(min mV)

MODE _____

RANGE, mV/cm _____

SAMPLE SIZE _____

LOAD, g _____

dY _____

WT (mg)
= 0.83

0.34

0.04

0.55

TEMPERATURE, °C (CHROMEL/ALUMEL)

100 200 300 400 500 600 700 800 900 1000 1100 1200

Du Pont Instruments MEASURED VARIABLE BY CONTROL

PART NO. 990526

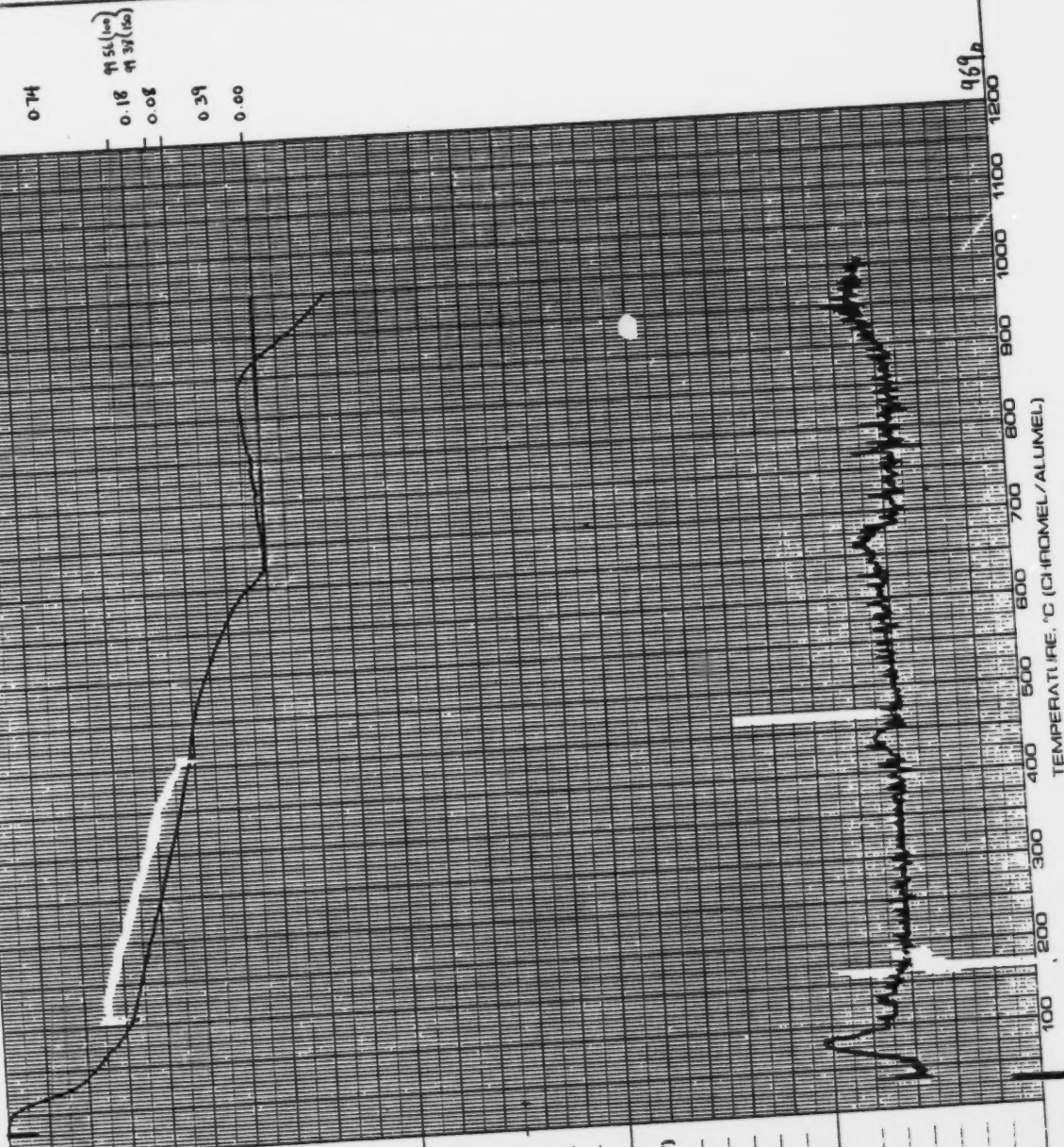
RUN NO. _____ DATE Jan 15, 1981
 OPERATOR S.M.
 SAMPLE 6000 (70) 5h
 ATM N₂
 FLOW RATE 100 CC/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL ISO
 SHIFT, cm ±10
 TIME, min/cm .25

TGA 50 µg/mV DTG 50 µg/(min mV)
 SUPPRESSION, mg 39.25
 RANGE, mV/cm 1
 WEIGHT, mg 41.28
 TIME CONST., sec 1
 dY .6

TMA 1 µm/mV DTM 0.1 µm/(min mV)
 MODE _____
 RANGE, mV/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



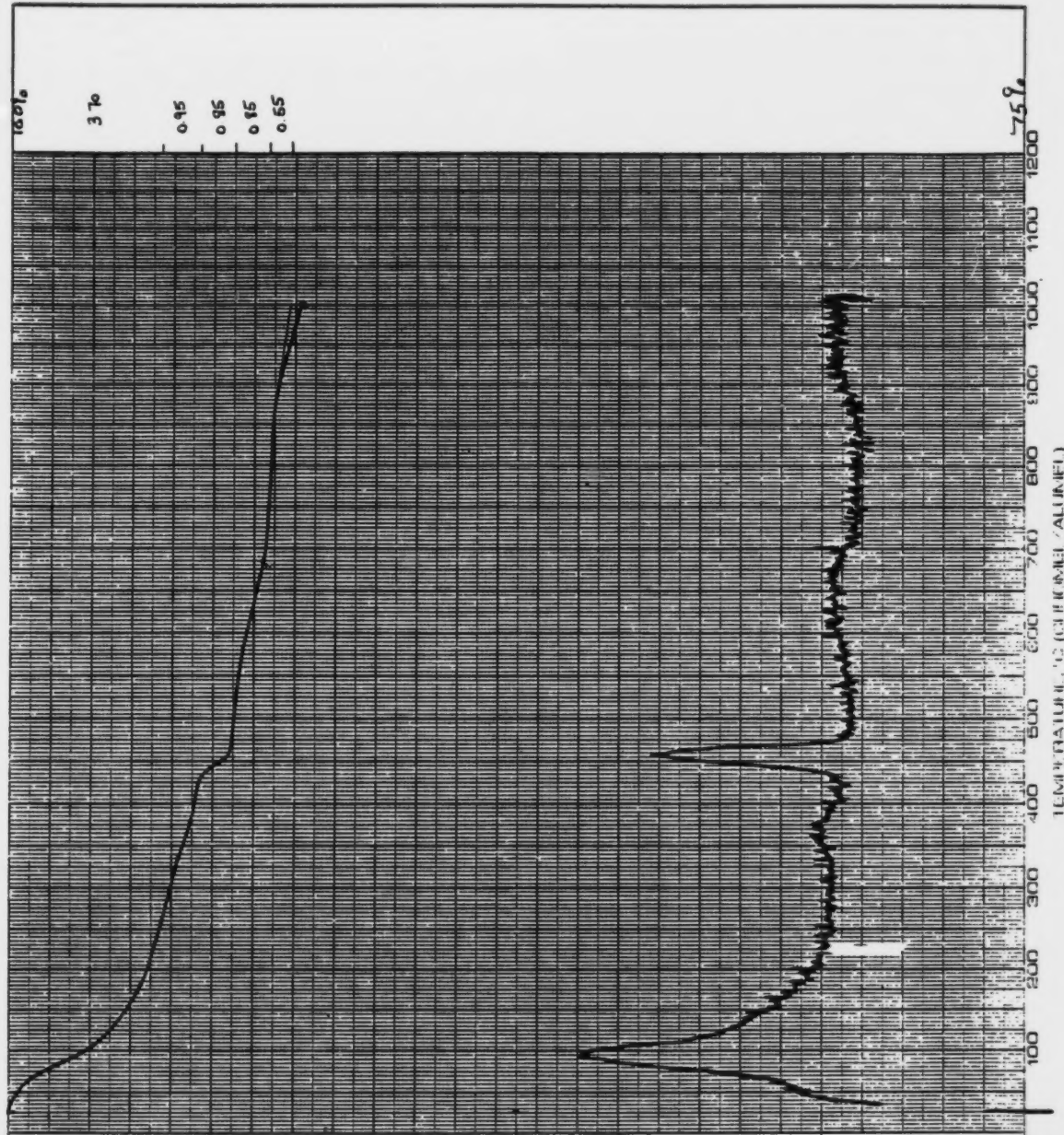
DuPont Instruments

MEASURED VARIABLE

PART NO. 990526

DuPont Instruments MEASURED VARIABLE (UNIT & SCALE)

RUN NO. _____ DATE <u>June 21, 1965</u> OPERATOR <u>J. CO.</u> SAMPLE <u>6000 (70) 11</u> ATM. <u>N₂</u> FLOW RATE <u>100 cc/min</u>	
T-AXIS PROG. RATE, °C/min <u>10</u> RANGE, °C/cm <u>50</u> HEAT ☒ COOL <u>180</u> SHFT, cm <u>+10</u> TIME, min/cm <u>.25</u>	
TGA 50 μ g/mv DTG 50 μ g/(min mv) SUPPRESSION, mg <u>27.50</u> RANGE, mv/cm <u>5</u> WEIGHT, mg <u>36.32</u> TIME CONST., sec <u>1</u> dY <u>5</u>	
TMA 1 μ m/mv DTM 0.1 μ m/(min mv) MODE _____ RANGE, mv/cm _____ SAMPLE SIZE _____ LOAD, g _____ dY _____	



Du Pont Instruments

MEASURED VARIABLE

PART NO. 990526

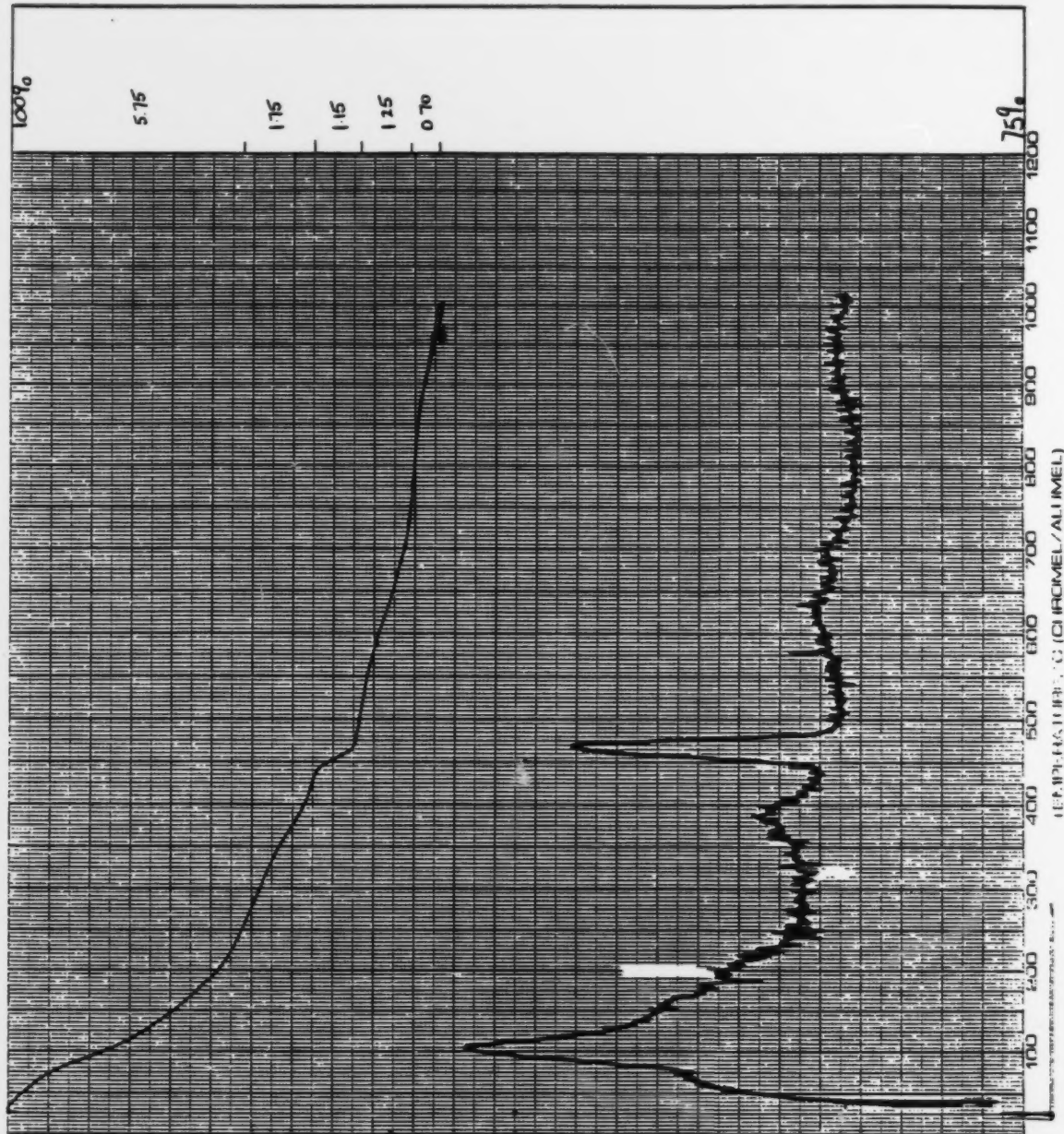
RUN NO. _____ DATE JULY 3, 1965
 OPERATOR SM
 SAMPLE 6000 (70) 3d
 ATM N₂
 FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL 180
 SHIFT, cm +10
 TIME, min/cm 35

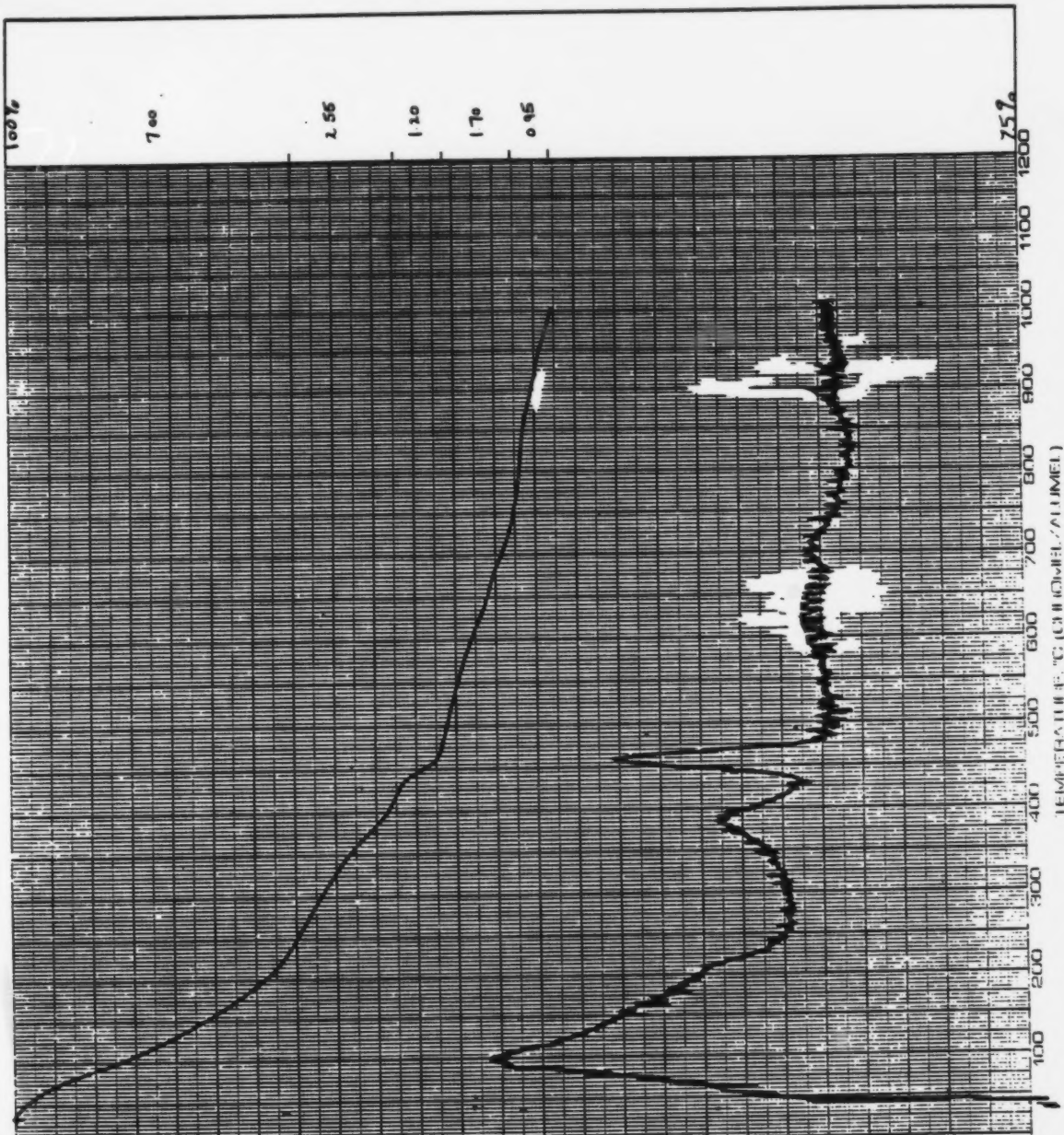
TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mg 30.28
 RANGE, mv/cm 5
 WEIGHT, mg 41.12
 TIME CONST., sec 1
 dY 5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



PART NO. 990526

RUN NO. _____ DATE <u>June 21, 1975</u> OPERATOR <u>J.M.</u> SAMPLE <u>6000 (70) 7d</u> ATM <u>N₂</u> FLOW RATE <u>100 cc/min</u>	
T-AXIS PROG. RATE, °C/min <u>10</u> RANGE, °C/cm <u>50</u> HEAT ☒ COOL <u>180</u> SHFT, cm <u>+10</u> TIME, min/cm <u>35</u>	
TGA 50 µg/mv DTG 50 µg/(min mv) SUPPRESSION, mg <u>27.89</u> RANGE, mv/cm <u>5</u> WEIGHT, mg <u>37.18</u> TIME CONST., sec <u>1</u> dY <u>.5</u>	
TMA 1 µm/mv DTM 0.1 µm/(min mv) MODE _____ RANGE, mv/cm _____ SAMPLE SIZE _____ LOAD, g _____ dY _____	



PART NO. 990526

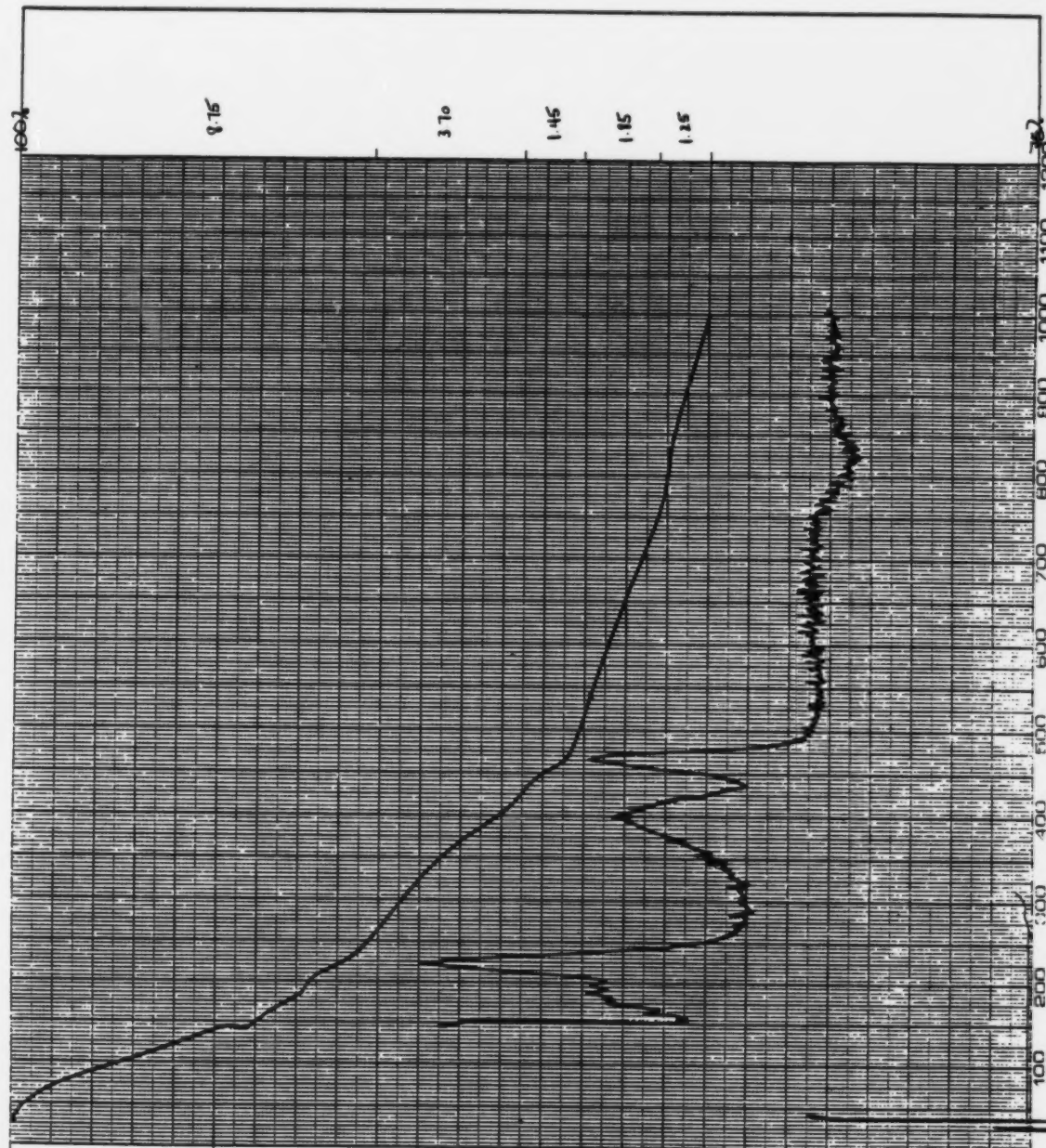
RUN NO. _____ DATE June 24 85
 OPERATOR S. Harndt
 SAMPLE 6000 (30) 28.1
 ATM N₂
 FLOW RATE 100 cc/min

T-AXIS

PROG. RATE, °C/min 10
 RANGE, °C/cm 50
 HEAT ☒ COOL ISO
 SHIFT, cm ±10
 TIME, min/cm 25

TGA 50 µg/mv DTG 50 µg/(min mv)
 SUPPRESSION, mg 33.20
 RANGE, mv/cm 5.0
 WEIGHT, mg 44.44
 TIME CONST., sec 1
 dY 0.5

TMA 1 µm/mv DTM 0.1 µm/(min mv)
 MODE _____
 RANGE, mv/cm _____
 SAMPLE SIZE _____
 LOAD, g _____
 dY _____



TEMPERATURE, °C (3 IF 1000, 41 UNITS)

APPENDIX C

Raw Porosimetry Data

C1. Control - 1,3,7,28d
C2. 4000 (50) - 1,3,7,28d
C3. 6000 (50) - 1,3,7,28d

C1. Control - 1,3,7,28d

ONTARIO RESEARCH FPL
CONTROL 1
PNTR NUMBER +45

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+1.0800 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+72.5700 G	INITIAL PRESSURE =	+0.9451 PSIA
PNTR+SAMPLE WEIGHT =	+73.6500 G	PORE DIAMETER =	+191.3750 MICRO-M
PNTR+SAMPLE+MERCURY =	+158.4300 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.9712 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.2812 CC/G
TOTAL PORE AREA =	+54.0920 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.1880 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0046 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0208 MICROMETERS
BULK DENSITY =	+1.5281 G/CC
APPARENT (SKELETAL) DENSITY =	+2.6799 G/CC

% CAPILLARY = +79.0984

5-100-21-41.9

ONTARIO RESEARCH FPL
CONTROL 1
PNTR NUMBER +45

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+191.3750	+0.0000	+0.0000	+191.3740	+0.0000
+2.0	+89.4468	+0.0015	+0.0000	+140.4110	+0.0015
+3.0	+60.9564	+0.0022	+0.0001	+75.2015	+0.0007
+4.0	+45.0499	+0.0024	+0.0001	+53.0031	+0.0002
+5.0	+36.1984	+0.0027	+0.0001	+40.6241	+0.0002
+5.9	+30.5158	+0.0029	+0.0002	+33.3571	+0.0002
+7.0	+25.8777	+0.0029	+0.0002	+28.1967	+0.0000
+8.0	+22.6282	+0.0032	+0.0002	+24.2529	+0.0002
+9.0	+20.1037	+0.0034	+0.0002	+21.3659	+0.0002
+10.0	+18.0859	+0.0034	+0.0002	+19.0948	+0.0000
+12.0	+15.0900	+0.0039	+0.0004	+16.5880	+0.0005
+13.9	+12.9865	+0.0039	+0.0004	+14.0383	+0.0000
+15.9	+11.3557	+0.0039	+0.0004	+12.1711	+0.0000
+17.9	+10.0971	+0.0042	+0.0004	+10.7264	+0.0002
+20.0	+9.0596	+0.0044	+0.0006	+9.5783	+0.0002
+28.9	+6.2605	+0.0044	+0.0006	+7.6600	+0.0000
+39.4	+4.5944	+0.0044	+0.0006	+5.4275	+0.0000
+49.8	+3.6289	+0.0047	+0.0008	+4.1117	+0.0003
+59.4	+3.0469	+0.0049	+0.0011	+3.3379	+0.0003
+80.8	+2.2379	+0.0054	+0.0019	+2.6424	+0.0005
+99.2	+1.8231	+0.0057	+0.0024	+2.0305	+0.0003
+124.4	+1.4539	+0.0064	+0.0042	+1.6385	+0.0007
+150.5	+1.2015	+0.0082	+0.0094	+1.3277	+0.0017
+175.5	+1.0308	+0.0126	+0.0252	+1.1162	+0.0044
+199.3	+0.9075	+0.0211	+0.0605	+0.9692	+0.0086
+237.8	+0.7604	+0.0541	+0.2186	+0.8340	+0.0330
+282.9	+0.6394	+0.0814	+0.3749	+0.6999	+0.0274
+317.9	+0.5689	+0.0900	+0.4316	+0.6041	+0.0086
+358.9	+0.5040	+0.0976	+0.4882	+0.5364	+0.0076
+398.8	+0.4535	+0.1030	+0.5332	+0.4787	+0.0054
+449.6	+0.4023	+0.1091	+0.5905	+0.4279	+0.0061
+499.3	+0.3622	+0.1138	+0.6393	+0.3823	+0.0047
+596.9	+0.3030	+0.1219	+0.7368	+0.3326	+0.0081
+698.4	+0.2590	+0.1280	+0.8243	+0.2810	+0.0062
+797.0	+0.2269	+0.1332	+0.9095	+0.2429	+0.0052
+995.2	+0.1817	+0.1418	+1.0783	+0.2043	+0.0066
+1250.0	+0.1447	+0.1505	+1.2901	+0.1632	+0.0066
+1500.0	+0.1206	+0.1574	+1.4987	+0.1326	+0.0069
+1745.1	+0.1036	+0.1628	+1.6929	+0.1121	+0.0054
+1995.1	+0.0907	+0.1678	+1.8967	+0.0971	+0.0049
+2487.0	+0.0727	+0.1762	+2.3088	+0.0817	+0.0084
+2993.1	+0.0604	+0.1816	+2.6374	+0.0666	+0.0055
+3981.0	+0.0454	+0.1906	+3.3129	+0.0529	+0.0089
+5009.1	+0.0361	+0.1971	+3.9470	+0.0408	+0.0065
+7452.9	+0.0243	+0.2082	+5.4265	+0.0302	+0.0112
+9956.4	+0.0182	+0.2161	+6.9200	+0.0212	+0.0079
+12444.5	+0.0145	+0.2226	+8.4900	+0.0163	+0.0064
+14933.5	+0.0121	+0.2277	+10.0434	+0.0133	+0.0052

ONTARIO RESEARCH FPL
CONTROL 1
PNTR NUMBER +45

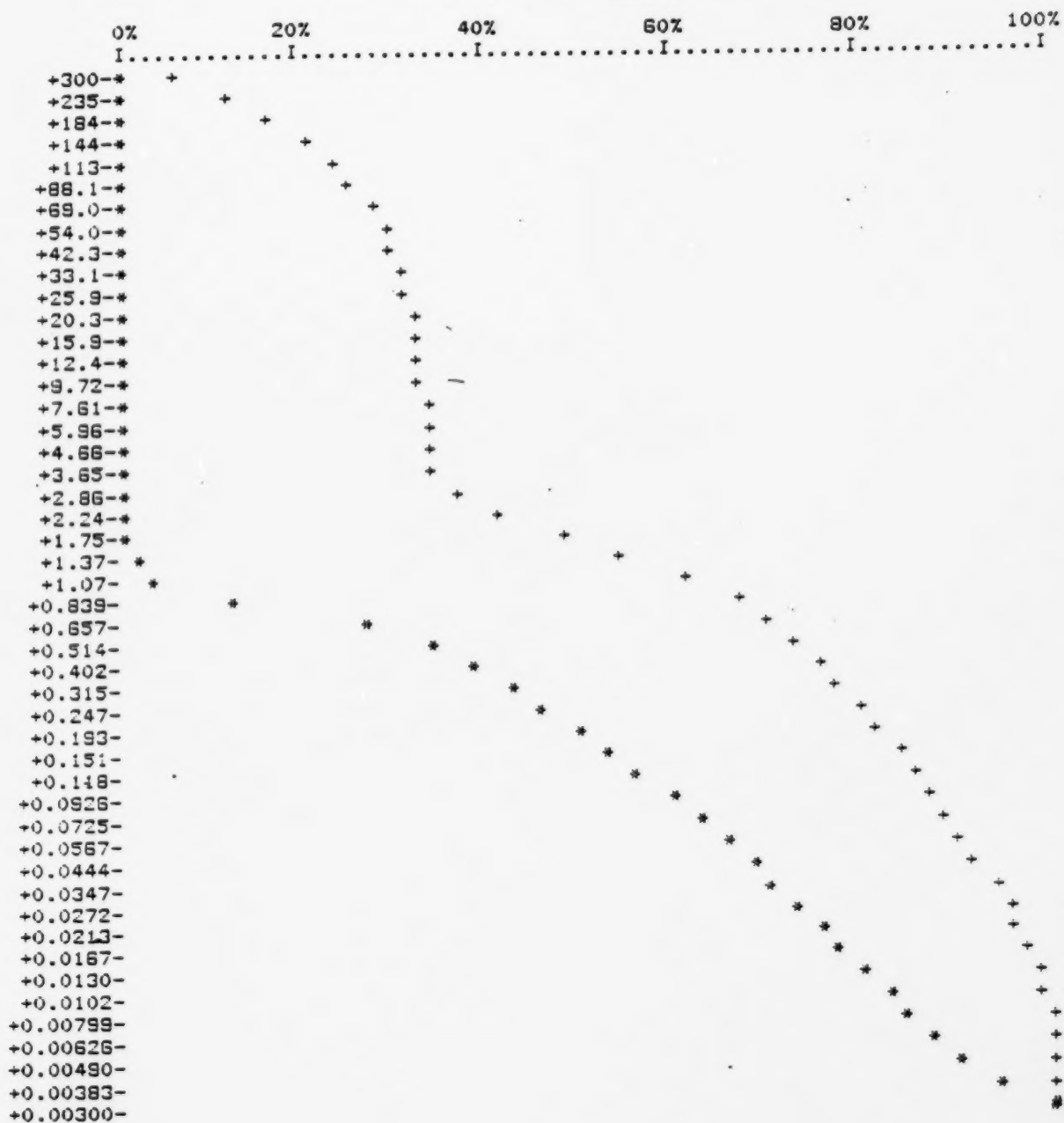
LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20044.8	+0.0090	+0.2354	+12.9299	+0.0106	+0.0076
+24887.9	+0.0073	+0.2410	+15.7007	+0.0081	+0.0056
+29865.1	+0.0061	+0.2464	+18.9332	+0.0067	+0.0054
+39998.4	+0.0045	+0.2576	+27.4259	+0.0053	+0.0112
+49908.2	+0.0036	+0.2656	+35.3216	+0.0041	+0.0080
+59847.7	+0.0030	+0.2812	+54.0920	+0.0033	+0.0156
+50116.6	+0.0036	+0.2812	+54.0920	+0.0033	+0.0000
+40117.3	+0.0045	+0.2812	+54.0920	+0.0041	+0.0000
+30043.5	+0.0060	+0.2812	+54.0920	+0.0053	+0.0000
+25066.2	+0.0072	+0.2808	+53.8043	+0.0066	-0.0005
+20074.1	+0.0090	+0.2793	+53.0671	+0.0081	-0.0015
+15037.2	+0.0120	+0.2770	+52.2090	+0.0105	-0.0023
+12548.6	+0.0144	+0.2748	+51.5296	+0.0132	-0.0022
+10045.0	+0.0180	+0.2725	+50.9698	+0.0162	-0.0023
+7526.7	+0.0240	+0.2690	+50.2982	+0.0210	-0.0035
+5008.3	+0.0361	+0.2629	+49.4939	+0.0301	-0.0060
+3511.6	+0.0515	+0.2554	+48.8085	+0.0438	-0.0075
+2505.3	+0.0722	+0.2491	+48.4021	+0.0618	-0.0063
+999.9	+0.1809	+0.2301	+47.8015	+0.1265	-0.0190
+749.9	+0.2412	+0.2239	+47.6838	+0.2110	-0.0062
+500.0	+0.3617	+0.2140	+47.5526	+0.3015	-0.0095
+397.5	+0.4550	+0.2079	+47.4923	+0.4084	-0.0062
+299.9	+0.6030	+0.1998	+47.4310	+0.5290	-0.0081
+248.2	+0.7286	+0.1944	+47.3985	+0.6658	-0.0054
+197.5	+0.9157	+0.1868	+47.3616	+0.8221	-0.0076
+148.2	+1.2200	+0.1582	+47.2545	+1.0678	-0.0286
+97.8	+1.8490	+0.1313	+47.1845	+1.5345	-0.0269
+75.0	+2.4118	+0.1115	+47.1473	+2.1304	-0.0198
+60.1	+3.0085	+0.1003	+47.1307	+2.7101	-0.0112
+49.5	+3.6503	+0.0962	+47.1257	+3.3294	-0.0042
+21.9	+8.2398	+0.0944	+47.1246	+5.9450	-0.0017

ONTARIO RESEARCH FPL
CONTROL 1
PNTR NUMBER +45

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.2812



ONTARIO RESEARCH FPL

CONTROL 1

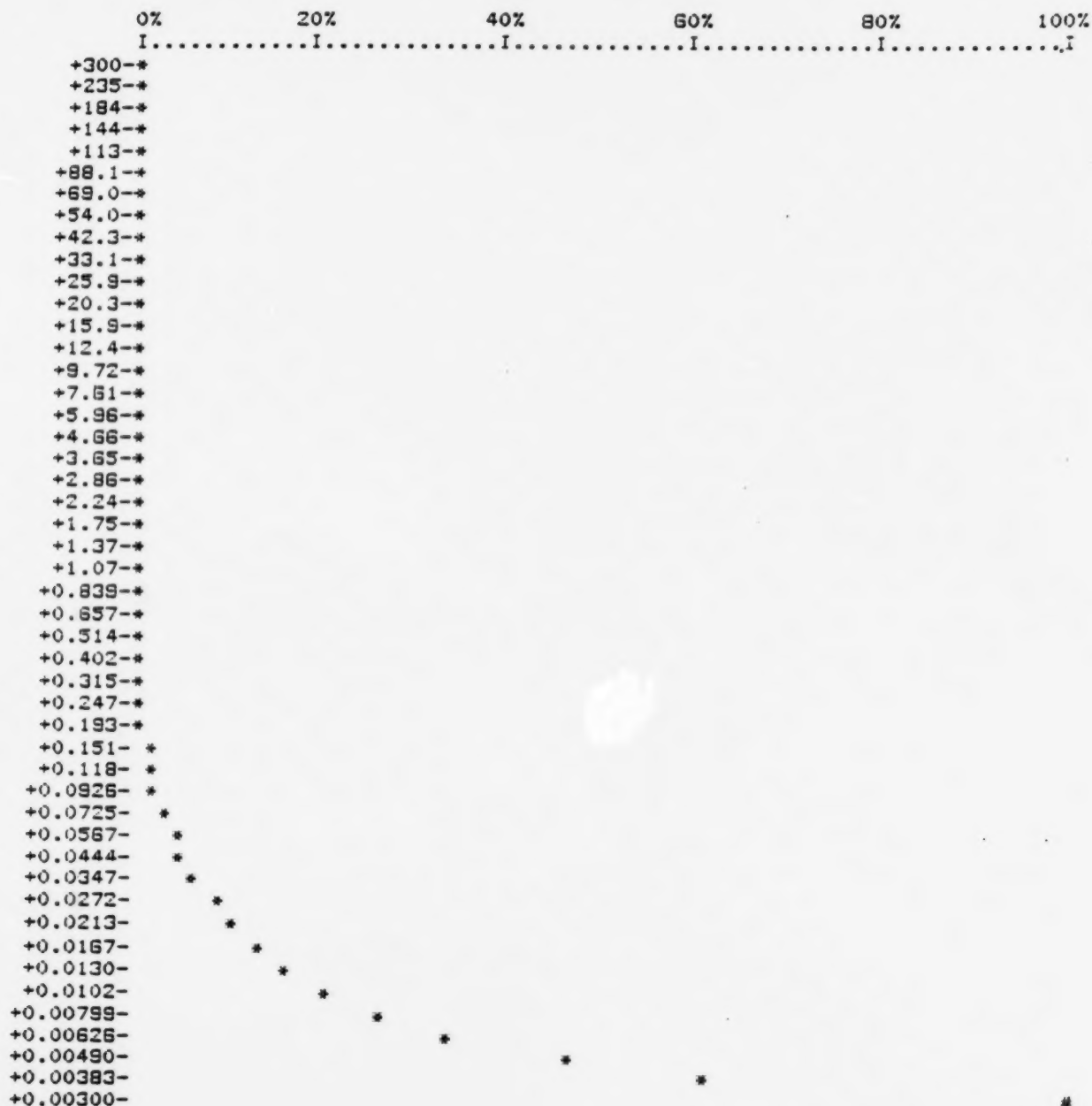
PNTR NUMBER +45

LP 15:51:29 7/16/85

HP 16:22:48 7/16/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER

100% = +54.0920



ONTARIO RESEARCH FPL

CONTROL 1

PNTR NUMBER +45

LP 15:51:29 7/16/85

HP 16:22:48 7/16/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER

100% = +0.281681E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--					
+235--					
+184--					
+144--					
+113---					
+88.1----					
+69.0---					
+54.0--					
+42.3--					
+33.1--					
+25.9--					
+20.3--					
+15.9--					
+12.4--					
+9.72--					
+7.61--					
+5.96--					
+4.66--					
+3.65--					
+2.86--					
+2.24--					
+1.75--					
+1.37---					
+1.07-----					
+0.839-----					
+0.657-----					
+0.514-----					
+0.402-----					
+0.315-----					
+0.247-----					
+0.193-----					
+0.151-----					
+0.118-----					
+0.0926-----					
+0.0725-----					
+0.0567-----					
+0.0444-----					
+0.0347-----					
+0.0272-----					
+0.0213-----					
+0.0167-----					
+0.0130-----					
+0.0102-----					
+0.00799-----					
+0.00626-----					
+0.00490-----					
+0.00383-----					
+0.00300--					

ONTARIO RESEARCH FPL
CONTROL 1
PNTR NUMBER +45

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER

100% = +0.803439E+001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--					
+235--					
+184--					
+144--					
+113--					
+88.1--					
+69.0--					
+54.0--					
+42.3--					
+33.1--					
+25.9--					
+20.3--					
+15.9--					
+12.4--					
+9.72--					
+7.61--					
+5.96--					
+4.66--					
+3.65--					
+2.86--					
+2.24--					
+1.75--					
+1.37--					
+1.07--					
+0.839--					
+0.657--					
+0.514--					
+0.402--					
+0.315--					
+0.247--					
+0.193--					
+0.151--**					
+0.118--**					
+0.0926--**					
+0.0725--****					
+0.0567--****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*****					
+0.0130--*****					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
CONTROL 3
PNTR NUMBER +40

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7500 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.8800 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+71.1900 G	INITIAL PRESSURE =	+0.9670 PSIA
PNTR+SAMPLE WEIGHT =	+72.0700 G	PORE DIAMETER =	+187.0250 MICRO-M
PNTR+SAMPLE+MERCURY =	+155.9500 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.8059 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.2781 CC/G
TOTAL PORE AREA =	+58.0202 SG-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.0833 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0047 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0192 MICROMETERS
BULK DENSITY =	+1.4475 G/CC
APPARENT (SKELETAL) DENSITY =	+2.4230 G/CC

% CAPILLARY = +63.7367

Porosity = 40.3%

ONTARIO RESEARCH FPL
CONTROL 3
PNTR NUMBER +40

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+1.0	+187.0250	+0.0000	+0.0000	+187.0250	+0.0000
+2.0	+89.1239	+0.0018	+0.0001	+138.0740	+0.0018
+3.0	+61.1072	+0.0027	+0.0001	+75.1155	+0.0009
+4.0	+45.0499	+0.0033	+0.0001	+53.0785	+0.0006
+4.9	+36.6281	+0.0033	+0.0001	+40.8389	+0.0000
+5.9	+30.4782	+0.0039	+0.0002	+33.5531	+0.0006
+6.9	+26.1242	+0.0039	+0.0002	+28.3011	+0.0000
+8.0	+22.6489	+0.0042	+0.0003	+24.3865	+0.0003
+8.9	+20.3021	+0.0042	+0.0003	+21.4755	+0.0000
+10.0	+18.0992	+0.0042	+0.0003	+19.2006	+0.0000
+11.9	+15.1922	+0.0045	+0.0003	+16.6457	+0.0003
+14.0	+12.9253	+0.0045	+0.0003	+14.0587	+0.0000
+15.9	+11.3505	+0.0048	+0.0004	+12.1379	+0.0003
+17.9	+10.0929	+0.0051	+0.0006	+10.7217	+0.0003
+20.0	+9.0596	+0.0051	+0.0006	+9.5762	+0.0000
+28.8	+6.2751	+0.0051	+0.0006	+7.6673	+0.0000
+39.1	+4.6278	+0.0051	+0.0006	+5.4515	+0.0000
+50.1	+3.6069	+0.0051	+0.0006	+4.1173	+0.0000
+58.9	+3.0727	+0.0051	+0.0006	+3.3398	+0.0000
+79.7	+2.2704	+0.0052	+0.0007	+2.6715	+0.0001
+101.3	+1.7846	+0.0055	+0.0013	+2.0275	+0.0003
+123.7	+1.4622	+0.0055	+0.0014	+1.6234	+0.0000
+150.0	+1.2059	+0.0062	+0.0032	+1.3341	+0.0006
+174.2	+1.0381	+0.0062	+0.0033	+1.1220	+0.0000
+200.2	+0.9036	+0.0065	+0.0046	+0.9708	+0.0003
+238.6	+0.7579	+0.0080	+0.0120	+0.8307	+0.0015
+283.8	+0.6373	+0.0113	+0.0311	+0.6976	+0.0033
+319.9	+0.5654	+0.0162	+0.0631	+0.6013	+0.0048
+361.8	+0.4999	+0.0282	+0.1533	+0.5327	+0.0120
+398.7	+0.4536	+0.0453	+0.2967	+0.4768	+0.0171
+447.4	+0.4042	+0.0594	+0.4282	+0.4289	+0.0141
+498.1	+0.3631	+0.0696	+0.5347	+0.3837	+0.0102
+600.5	+0.3012	+0.0828	+0.6942	+0.3321	+0.0132
+701.0	+0.2580	+0.0916	+0.8193	+0.2796	+0.0087
+801.6	+0.2256	+0.0982	+0.9293	+0.2418	+0.0066
+1000.7	+0.1807	+0.1079	+1.1200	+0.2032	+0.0097
+1252.7	+0.1444	+0.1167	+1.3367	+0.1626	+0.0088
+1496.8	+0.1208	+0.1240	+1.5566	+0.1326	+0.0073
+1740.9	+0.1039	+0.1295	+1.7518	+0.1124	+0.0055
+1990.0	+0.0909	+0.1350	+1.9767	+0.0974	+0.0055
+2486.1	+0.0727	+0.1447	+2.4523	+0.0818	+0.0097
+2994.2	+0.0604	+0.1550	+3.0715	+0.0666	+0.0103
+3981.6	+0.0454	+0.1717	+4.3308	+0.0529	+0.0167
+4994.8	+0.0362	+0.1832	+5.4601	+0.0408	+0.0115
+7468.4	+0.0242	+0.2008	+7.7900	+0.0302	+0.0176
+9956.9	+0.0182	+0.2105	+9.6249	+0.0212	+0.0097
+12445.5	+0.0145	+0.2178	+11.4052	+0.0163	+0.0073
+14934.1	+0.0121	+0.2232	+13.0421	+0.0133	+0.0055

ONTARIO RESEARCH FPL
CONTROL 3
PNTR NUMBER +40

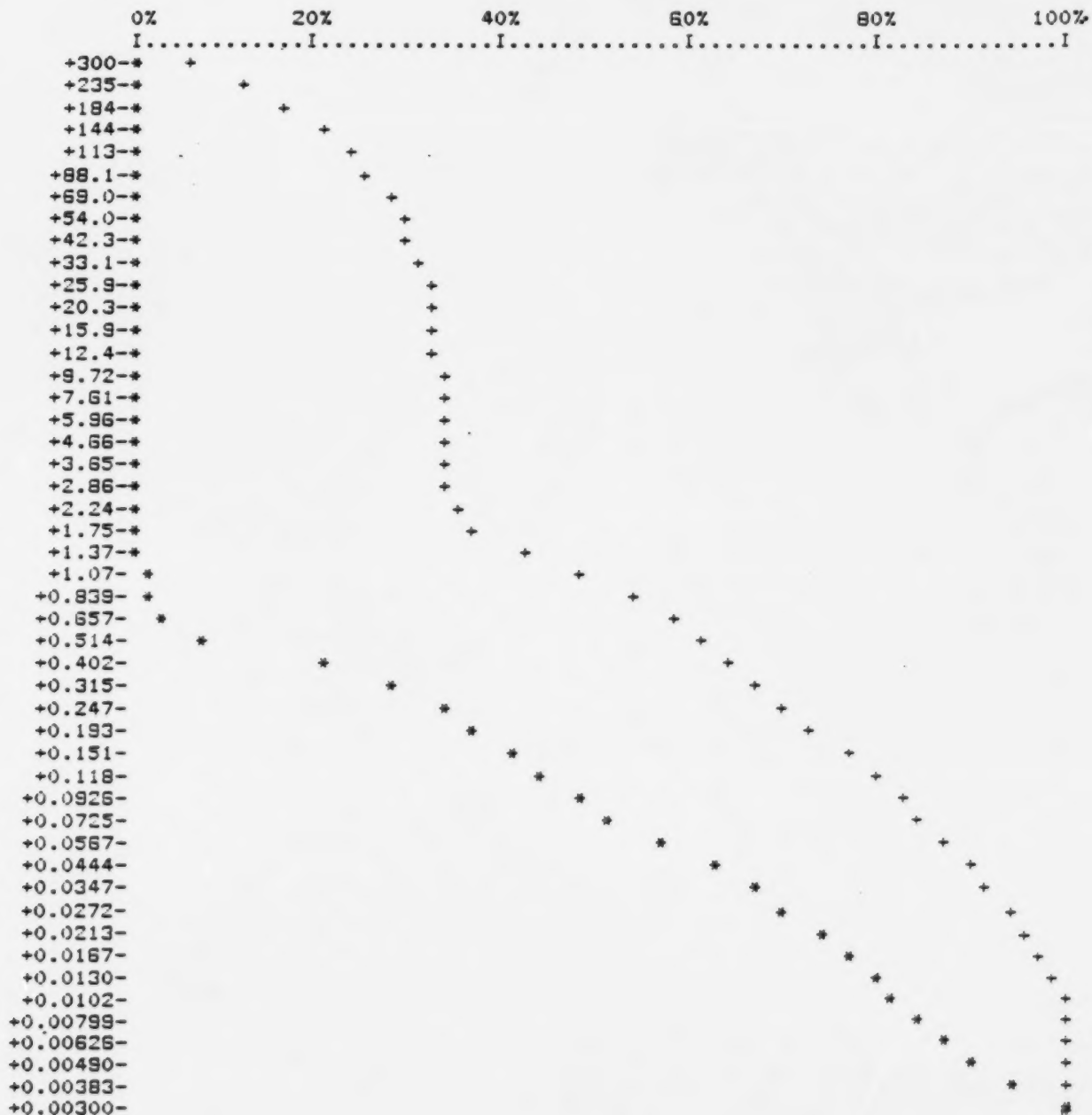
LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20060.3	+0.0090	+0.2317	+16.2457	+0.0106	+0.0085
+24873.6	+0.0073	+0.2377	+19.2056	+0.0081	+0.0060
+29985.0	+0.0060	+0.2434	+22.6388	+0.0067	+0.0057
+40043.7	+0.0045	+0.2530	+29.9110	+0.0053	+0.0096
+49908.9	+0.0036	+0.2626	+39.3130	+0.0041	+0.0096
+59818.6	+0.0030	+0.2781	+58.0202	+0.0033	+0.0155
+49789.5	+0.0036	+0.2781	+58.0202	+0.0033	+0.0000
+40132.9	+0.0045	+0.2781	+58.0202	+0.0041	+0.0000
+30044.2	+0.0060	+0.2781	+58.0202	+0.0053	+0.0000
+25066.9	+0.0072	+0.2781	+58.0202	+0.0066	+0.0000
+20089.6	+0.0090	+0.2778	+57.8608	+0.0081	-0.0003
+15052.8	+0.0120	+0.2744	+56.5789	+0.0105	-0.0034
+12543.3	+0.0144	+0.2714	+55.6540	+0.0132	-0.0031
+10030.8	+0.0180	+0.2680	+54.8196	+0.0162	-0.0034
+7527.4	+0.0240	+0.2628	+53.8251	+0.0210	-0.0052
+5009.0	+0.0361	+0.2538	+52.6387	+0.0301	-0.0089
+3510.7	+0.0515	+0.2437	+51.7156	+0.0438	-0.0101
+2503.4	+0.0722	+0.2345	+51.1202	+0.0619	-0.0092
+999.7	+0.1809	+0.2061	+50.2226	+0.1266	-0.0284
+749.8	+0.2412	+0.1967	+50.0441	+0.2111	-0.0094
+498.9	+0.3625	+0.1825	+49.8556	+0.3019	-0.0142
+397.4	+0.4552	+0.1752	+49.7846	+0.4089	-0.0073
+299.8	+0.6033	+0.1665	+49.7184	+0.5293	-0.0088
+249.0	+0.7263	+0.1604	+49.6821	+0.6648	-0.0060
+193.2	+0.9363	+0.1430	+49.5983	+0.8313	-0.0174
+148.8	+1.2153	+0.1250	+49.5314	+1.0758	-0.0180
+100.3	+1.8038	+0.1019	+49.4702	+1.5096	-0.0231
+74.1	+2.4408	+0.0959	+49.4589	+2.1223	-0.0060
+59.6	+3.0346	+0.0953	+49.4580	+2.7377	-0.0006
+49.7	+3.6378	+0.0947	+49.4572	+3.3362	-0.0006
+22.5	+8.0489	+0.0941	+49.4568	+5.8434	-0.0006

ONTARIO RESEARCH FPL
CONTROL 3
PNTR NUMBER +40

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

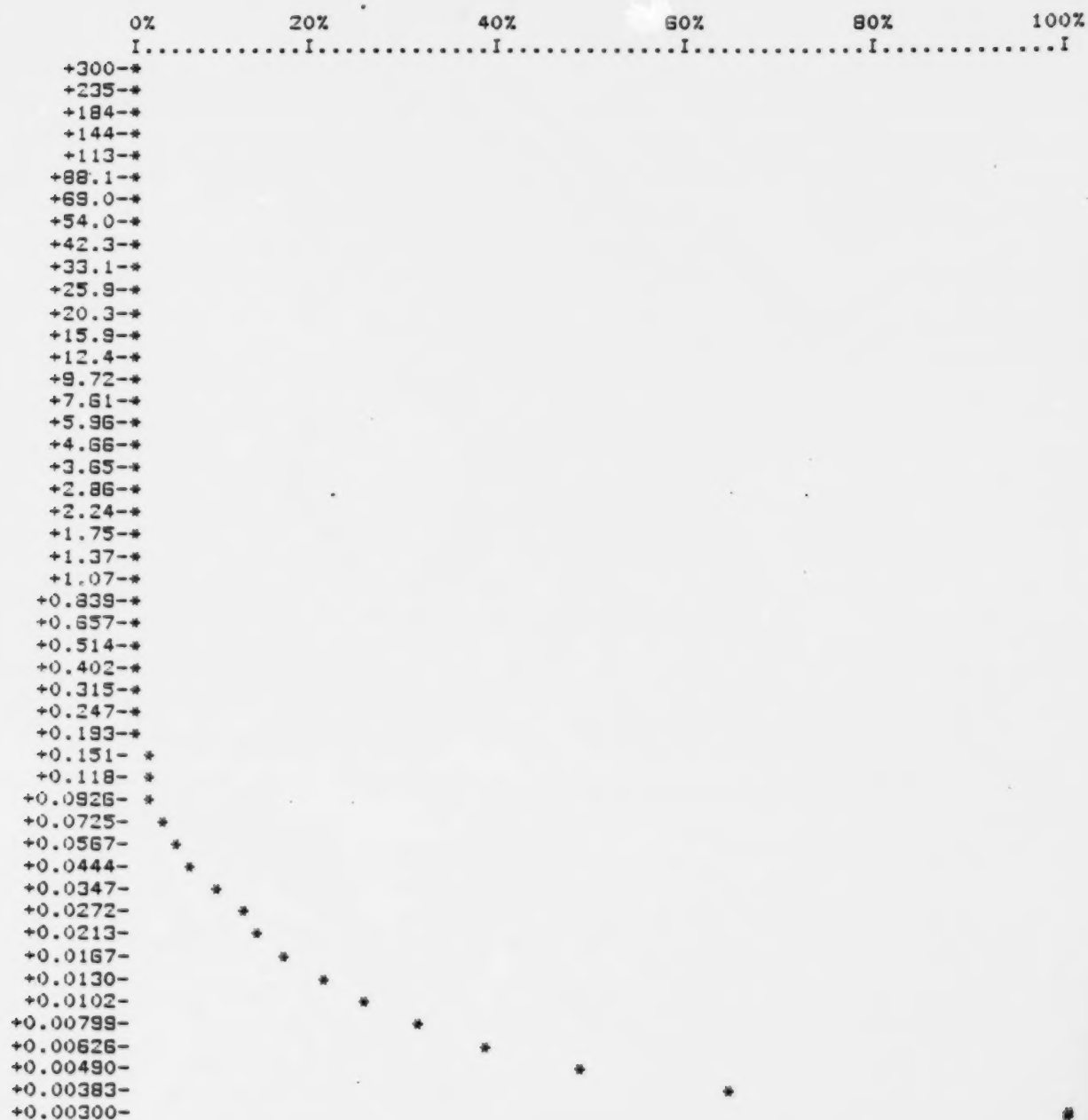
CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.2781



ONTARIO RESEARCH FPL
CONTROL 3
PNTR NUMBER +40

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +58.0202



ONTARIO RESEARCH FPL
CONTROL 3
PNTR NUMBER +40

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.160878E-001

	0%	20%	40%	60%	80%	100%
	I.....	I.....	I.....	I.....	I.....	I.....
+300--						
+235--						
+184--						
+144---						
+113-----						
+88.1-----						
+69.0-----						
+54.0---						
+42.3--						
+33.1--						
+25.9--						
+20.3--						
+15.9--						
+12.4--						
+9.72--						
+7.61--						
+5.96--						
+4.66--						
+3.65--						
+2.86--						
+2.24--						
+1.75--						
+1.37--						
+1.07--						
+0.839----						
+0.657-----						
+0.514-----						
+0.402-----						
+0.315-----						
+0.247-----						
+0.193-----						
+0.151-----						
+0.118-----						
+0.0926-----						
+0.0725-----						
+0.0567-----						
+0.0444-----						
+0.0347-----						
+0.0272-----						
+0.0213-----						
+0.0167-----						
+0.0130-----						
+0.0102-----						
+0.00799-----						
+0.00626-----						
+0.00490-----						
+0.00383-----						
+0.00300--						

ONTARIO RESEARCH FPL
CONTROL 3
PNTR NUMBER +40

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.890423E+001

0%	20%	40%	60%	80%	100%
I.....I.....I.....I.....I.....I					
+300--*					
+235--*					
+184--*					
+144--*					
+113--*					
+88.1--*					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--*					
+0.657--*					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--*					
+0.193--*					
+0.151--**					
+0.118--**					
+0.0926--**					
+0.0725--****					
+0.0567--*****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*****					
+0.0130--*****					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
CONTROL 7
PNTR NUMBER +45

LP 9:53:32 7/23/85
HP 10:14:44 7/23/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.8400 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+72.7600 G	INITIAL PRESSURE =	+0.9451 PSIA
PNTR+SAMPLE WEIGHT =	+73.6000 G	PORE DIAMETER =	+191.3750 MICRO-M
PNTR+SAMPLE+MERCURY =	+160.3800 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.9712 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.2598 CC/G
TOTAL PORE AREA =	+68.8288 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.0539 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0040 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0151 MICROMETERS
BULK DENSITY =	+1.5028 G/CC
APPARENT (SKELETAL) DENSITY =	+2.4654 G/CC

% CAPILLARY = +56.8368

100 - 56.8368 = 43.1632%

ONTARIO RESEARCH FPL
CONTROL 7
PNTR NUMBER +45

LP 9:53:32 7/23/85
HP 10:14:44 7/23/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SG-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+192.8700	+0.0000	+0.0000	+192.1220	+0.0000
+2.0	+89.4468	+0.0025	+0.0001	+141.1580	+0.0025
+3.0	+59.9207	+0.0035	+0.0001	+74.6837	+0.0009
+4.0	+44.9678	+0.0041	+0.0002	+52.4442	+0.0006
+4.9	+36.6281	+0.0044	+0.0002	+40.7979	+0.0003
+6.0	+30.2170	+0.0047	+0.0002	+33.4225	+0.0003
+7.0	+25.9048	+0.0050	+0.0003	+28.0609	-0.0003
+8.0	+22.6489	+0.0053	+0.0003	+24.2769	+0.0003
+9.0	+20.1694	+0.0053	+0.0003	+21.4091	+0.0000
+10.0	+18.1658	+0.0057	+0.0004	+19.1676	+0.0003
+12.0	+15.0808	+0.0060	+0.0005	+16.6233	+0.0003
+14.0	+12.9321	+0.0063	+0.0006	+14.0064	+0.0003
+15.9	+11.3609	+0.0063	+0.0006	+12.1465	+0.0000
+17.9	+10.1012	+0.0063	+0.0006	+10.7311	+0.0000
+20.0	+9.0562	+0.0066	+0.0007	+9.5787	+0.0003
+28.8	+6.2782	+0.0066	+0.0007	+7.6672	+0.0000
+38.8	+4.6652	+0.0068	+0.0008	+5.4717	+0.0002
+49.2	+3.6782	+0.0068	+0.0008	+4.1717	+0.0000
+58.8	+3.0739	+0.0071	+0.0012	+3.3760	+0.0003
+78.8	+2.2963	+0.0075	+0.0017	+2.6851	+0.0003
+99.1	+1.8259	+0.0078	+0.0024	+2.0611	+0.0003
+124.2	+1.4565	+0.0081	+0.0032	+1.6412	+0.0003
+149.6	+1.2090	+0.0085	+0.0042	+1.3327	+0.0003
+174.9	+1.0343	+0.0088	+0.0054	+1.1216	+0.0003
+199.6	+0.9060	+0.0091	+0.0068	+0.9701	+0.0003
+238.5	+0.7583	+0.0098	+0.0099	+0.8322	+0.0007
+280.9	+0.6439	+0.0108	+0.0155	+0.7011	+0.0010
+319.9	+0.5653	+0.0114	+0.0199	+0.6046	+0.0007
+360.0	+0.5024	+0.0124	+0.0272	+0.5338	+0.0010
+401.0	+0.4510	+0.0146	+0.0458	+0.4767	+0.0022
+449.8	+0.4021	+0.0184	+0.0815	+0.4266	+0.0038
+499.6	+0.3620	+0.0235	+0.1344	+0.3821	+0.0051
+600.1	+0.3014	+0.0348	+0.2714	+0.3317	+0.0114
+696.6	+0.2596	+0.0459	+0.4288	+0.2805	+0.0110
+797.1	+0.2269	+0.0588	+0.6413	+0.2433	+0.0129
+995.3	+0.1817	+0.0702	+0.8646	+0.2043	+0.0114
+1250.2	+0.1447	+0.0801	+1.1061	+0.1632	+0.0099
+1500.1	+0.1206	+0.0868	+1.3082	+0.1326	+0.0067
+1746.2	+0.1036	+0.0928	+1.5245	+0.1121	+0.0061
+1998.2	+0.0905	+0.0982	+1.7480	+0.0970	+0.0054
+2490.4	+0.0726	+0.1091	+2.2785	+0.0816	+0.0108
+2986.7	+0.0606	+0.1211	+3.0023	+0.0666	+0.0120
+3982.0	+0.0454	+0.1411	+4.5093	+0.0530	+0.0200
+4995.2	+0.0362	+0.1547	+5.8462	+0.0408	+0.0136
+7468.8	+0.0242	+0.1738	+8.3703	+0.0302	+0.0191
+9957.3	+0.0182	+0.1840	+10.2927	+0.0212	+0.0102
+12445.9	+0.0145	+0.1919	+12.2346	+0.0163	+0.0079
+14934.4	+0.0121	+0.1982	+14.1378	+0.0133	+0.0063

ONTARIO RESEARCH FPL
CONTROL 7
PNTR NUMBER +45

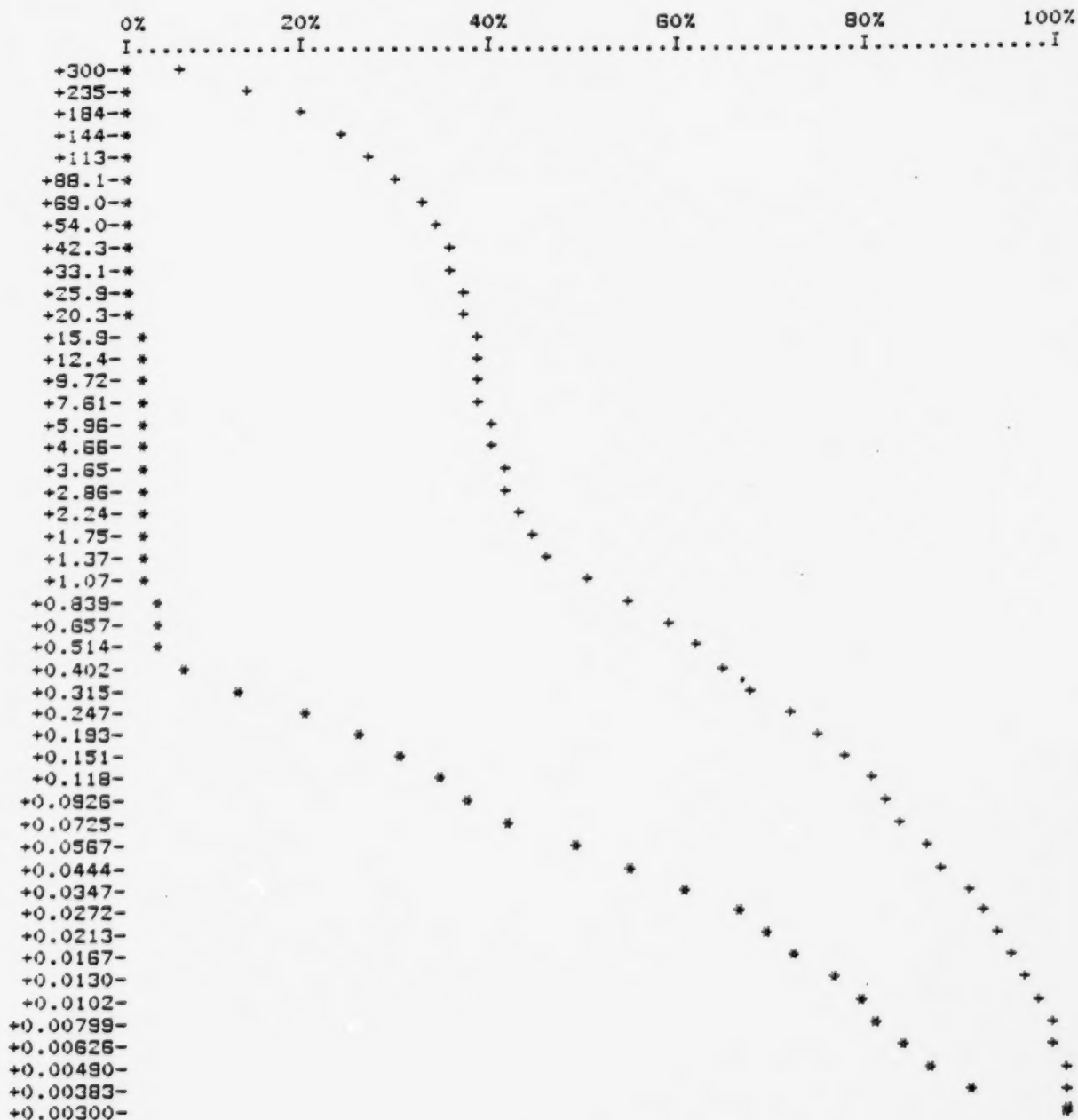
LP 9:53:32 7/23/85
HP 10:14:44 7/23/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20001.1	+0.0090	+0.2065	+17.2524	+0.0106	+0.0082
+24993.2	+0.0072	+0.2118	+19.8929	+0.0081	+0.0054
+29940.7	+0.0060	+0.2166	+22.7401	+0.0066	+0.0047
+39954.8	+0.0045	+0.2254	+29.3954	+0.0053	+0.0088
+49819.8	+0.0036	+0.2344	+38.3023	+0.0041	+0.0091
+59863.6	+0.0030	+0.2598	+68.8288	+0.0033	+0.0254
+50072.9	+0.0036	+0.2598	+68.8288	+0.0033	+0.0000
+40163.0	+0.0045	+0.2596	+68.5615	+0.0041	-0.0003
+30104.2	+0.0060	+0.2580	+67.3622	+0.0053	-0.0016
+25067.3	+0.0072	+0.2561	+66.2114	+0.0066	-0.0019
+20090.0	+0.0090	+0.2538	+65.1085	+0.0081	-0.0022
+15053.1	+0.0120	+0.2500	+63.6461	+0.0105	-0.0038
+12549.6	+0.0144	+0.2474	+62.8671	+0.0132	-0.0026
+10031.2	+0.0180	+0.2433	+61.8382	+0.0162	-0.0042
+7527.7	+0.0240	+0.2387	+60.9753	+0.0210	-0.0045
+5024.2	+0.0360	+0.2322	+60.1067	+0.0300	-0.0065
+3509.5	+0.0515	+0.2238	+59.3390	+0.0438	-0.0084
+2500.2	+0.0723	+0.2163	+58.8576	+0.0619	-0.0075
+999.9	+0.1809	+0.1935	+58.1355	+0.1266	-0.0229
+751.9	+0.2405	+0.1849	+57.9720	+0.2107	-0.0086
+500.0	+0.3617	+0.1709	+57.7865	+0.3011	-0.0140
+397.5	+0.4549	+0.1636	+57.7151	+0.4083	-0.0073
+300.0	+0.6029	+0.1541	+57.6434	+0.5289	-0.0095
+248.7	+0.7272	+0.1503	+57.6205	+0.6651	-0.0038
+198.9	+0.9095	+0.1371	+57.5559	+0.8183	-0.0132
+149.3	+1.2117	+0.1223	+57.5001	+1.0606	-0.0148
+98.6	+1.8347	+0.1144	+57.4794	+1.5232	-0.0079
+75.0	+2.4131	+0.1107	+57.4722	+2.1239	-0.0036
+59.4	+3.0461	+0.1078	+57.4681	+2.7296	-0.0028
+49.8	+3.6320	+0.1059	+57.4658	+3.3391	-0.0019
+23.2	+7.8047	+0.1015	+57.4627	+5.7184	-0.0044

ONTARIO RESEARCH FPL
CONTROL 7
PNTR NUMBER +45

LP 9:53:32 7/23/85
HP 10:14:44 7/23/85

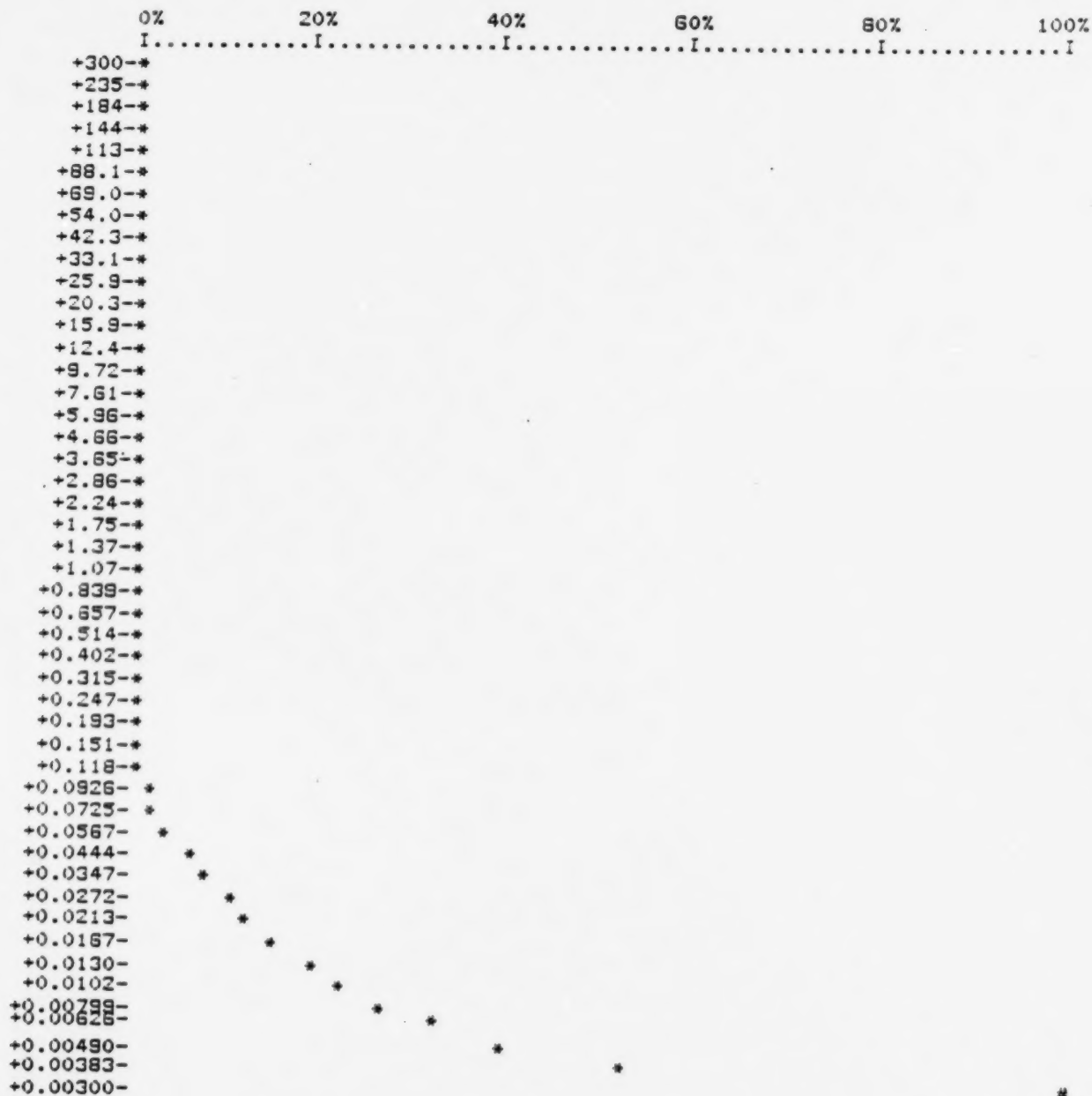
CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.2598



ONTARIO RESEARCH FPL
CONTROL 7
PNTR NUMBER +45

LP 9:53:32 7/23/85
HP 10:14:44 7/23/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +68.8288



ONTARIO RESEARCH FPL
CONTROL 7
PNTR NUMBER +45

LP 9:53:32 7/23/85
HP 10:14:44 7/23/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.192587E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300-*					
+235-*					
+184-*					
+144-****					
+113-*****					
+88.1-*****					
+69.0-*****					
+54.0-***					
+42.3-**					
+33.1-*					
+25.9-*					
+20.3-*					
+15.9-*					
+12.4-*					
+9.72-*					
+7.61-*					
+5.96-*					
+4.66-*					
+3.65-*					
+2.86-*					
+2.24-*					
+1.75-*					
+1.37-*					
+1.07-*					
+0.839-*					
+0.657-*					
+0.514-*					
+0.402-*****					
+0.315-*****					
+0.247-*****					
+0.193-*****					
+0.151-*****					
+0.118-*****					
+0.0926-*****					
+0.0725-*****					
+0.0567-*****					
+0.0444-*****					
+0.0347-*****					
+0.0272-*****					
+0.0213-*****					
+0.0167-*****					
+0.0130-*****					
+0.0102-*****					
+0.00799-*****					
+0.00626-*****					
+0.00490-*****					
+0.00383-*****					
+0.00300-*					

ONTARIO RESEARCH FPL
CONTROL 7
PNTR NUMBER +45

LP 9:53:32 7/23/85
HP 10:14:44 7/23/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.839912E+001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--*					
+235--*					
+184--*					
+144--*					
+113--*					
+88.1--*					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--*					
+0.657--*					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--*					
+0.193--**					
+0.151--**					
+0.118--**					
+0.0926--**					
+0.0725--****					
+0.0567--*****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*****					
+0.0130--*****					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
CONTROL 28 DAYS
PNTR NUMBER +45

LP 8:28:7 8/14/85
HP 8:49:0 8/14/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.7700 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+72.6700 G	INITIAL PRESSURE =	+0.9597 PSIA
PNTR+SAMPLE WEIGHT =	+73.4400 G	PORE DIAMETER =	+188.4530 MICRO-M
PNTR+SAMPLE+MERCURY =	+161.3200 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.9712 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.2097 CC/G
TOTAL PORE AREA =	+58.8517 SG-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.0347 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0057 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0143 MICROMETERS
BULK DENSITY =	+1.6120 G/CC
APPARENT (SKELETAL) DENSITY =	+2.4353 G/CC

% CAPILLARY = +42.0558

% Porosity = 33.8%

ONTARIO RESEARCH FPL
CONTROL 28 DAYS
PNTR NUMBER +45

LP 8:28:7 8/14/85
HP 8:49:0 8/14/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+1.0	+188.4530	+0.0000	+0.0000	+188.4530	+0.0000
+2.0	+89.4468	+0.0007	+0.0000	+138.9500	+0.0007
+3.0	+61.2589	+0.0014	+0.0001	+75.3528	+0.0007
+4.0	+44.8860	+0.0014	+0.0001	+53.0724	+0.0000
+4.9	+36.5738	+0.0017	+0.0001	+40.7299	+0.0003
+6.0	+30.1801	+0.0021	+0.0001	+33.3769	+0.0003
+6.9	+26.1518	+0.0021	+0.0001	+28.1659	+0.0000
+7.9	+22.8798	+0.0021	+0.0001	+24.5158	+0.0000
+9.0	+20.1529	+0.0021	+0.0001	+21.5163	+0.0000
+10.0	+18.0859	+0.0024	+0.0002	+19.1194	+0.0003
+12.0	+15.0808	+0.0024	+0.0002	+16.5834	+0.0000
+14.0	+12.9253	+0.0028	+0.0003	+14.0030	+0.0003
+15.9	+11.3557	+0.0028	+0.0003	+12.1405	+0.0000
+17.9	+10.0971	+0.0028	+0.0003	+10.7264	+0.0000
+20.0	+9.0596	+0.0031	+0.0004	+9.5783	+0.0003
+28.5	+6.3504	+0.0031	+0.0004	+7.7050	+0.0000
+39.8	+4.5402	+0.0031	+0.0004	+5.4453	+0.0000
+49.7	+3.6374	+0.0032	+0.0005	+4.0888	+0.0001
+60.1	+3.0116	+0.0032	+0.0005	+3.3245	+0.0000
+78.5	+2.3035	+0.0032	+0.0005	+2.6575	+0.0000
+98.9	+1.8291	+0.0032	+0.0006	+2.0663	+0.0000
+124.9	+1.4482	+0.0033	+0.0007	+1.6386	+0.0000
+150.5	+1.2021	+0.0033	+0.0008	+1.3251	+0.0000
+175.7	+1.0296	+0.0033	+0.0008	+1.1159	+0.0000
+201.2	+0.8988	+0.0037	+0.0024	+0.9642	+0.0004
+238.7	+0.7576	+0.0037	+0.0025	+0.8282	+0.0000
+280.9	+0.6437	+0.0041	+0.0047	+0.7007	+0.0004
+322.0	+0.5617	+0.0041	+0.0049	+0.6027	+0.0000
+360.1	+0.5023	+0.0045	+0.0077	+0.5320	+0.0004
+398.2	+0.4542	+0.0045	+0.0080	+0.4783	+0.0000
+451.9	+0.4002	+0.0049	+0.0116	+0.4272	+0.0004
+501.7	+0.3605	+0.0049	+0.0120	+0.3804	+0.0000
+597.4	+0.3027	+0.0054	+0.0170	+0.3316	+0.0004
+702.9	+0.2573	+0.0058	+0.0230	+0.2800	+0.0004
+798.6	+0.2265	+0.0065	+0.0353	+0.2419	+0.0007
+995.9	+0.1816	+0.0070	+0.0444	+0.2040	+0.0005
+1244.0	+0.1454	+0.0082	+0.0729	+0.1635	+0.0012
+1498.0	+0.1207	+0.0107	+0.1487	+0.1331	+0.0025
+1743.1	+0.1038	+0.0166	+0.3598	+0.1122	+0.0059
+1996.0	+0.0906	+0.0263	+0.7583	+0.0972	+0.0097
+2487.2	+0.0727	+0.0497	+1.9062	+0.0817	+0.0234
+2985.3	+0.0606	+0.0673	+2.9620	+0.0666	+0.0176
+3982.6	+0.0454	+0.0898	+4.6574	+0.0530	+0.0225
+5010.7	+0.0361	+0.1026	+5.9166	+0.0408	+0.0129
+7469.4	+0.0242	+0.1220	+8.4935	+0.0302	+0.0194
+9972.8	+0.0181	+0.1342	+10.7862	+0.0212	+0.0121
+12446.5	+0.0145	+0.1435	+13.0740	+0.0163	+0.0093
+14935.0	+0.0121	+0.1511	+15.3558	+0.0133	+0.0076

ONTARIO RESEARCH FPL
CONTROL 28 DAYS
PNTR NUMBER +45

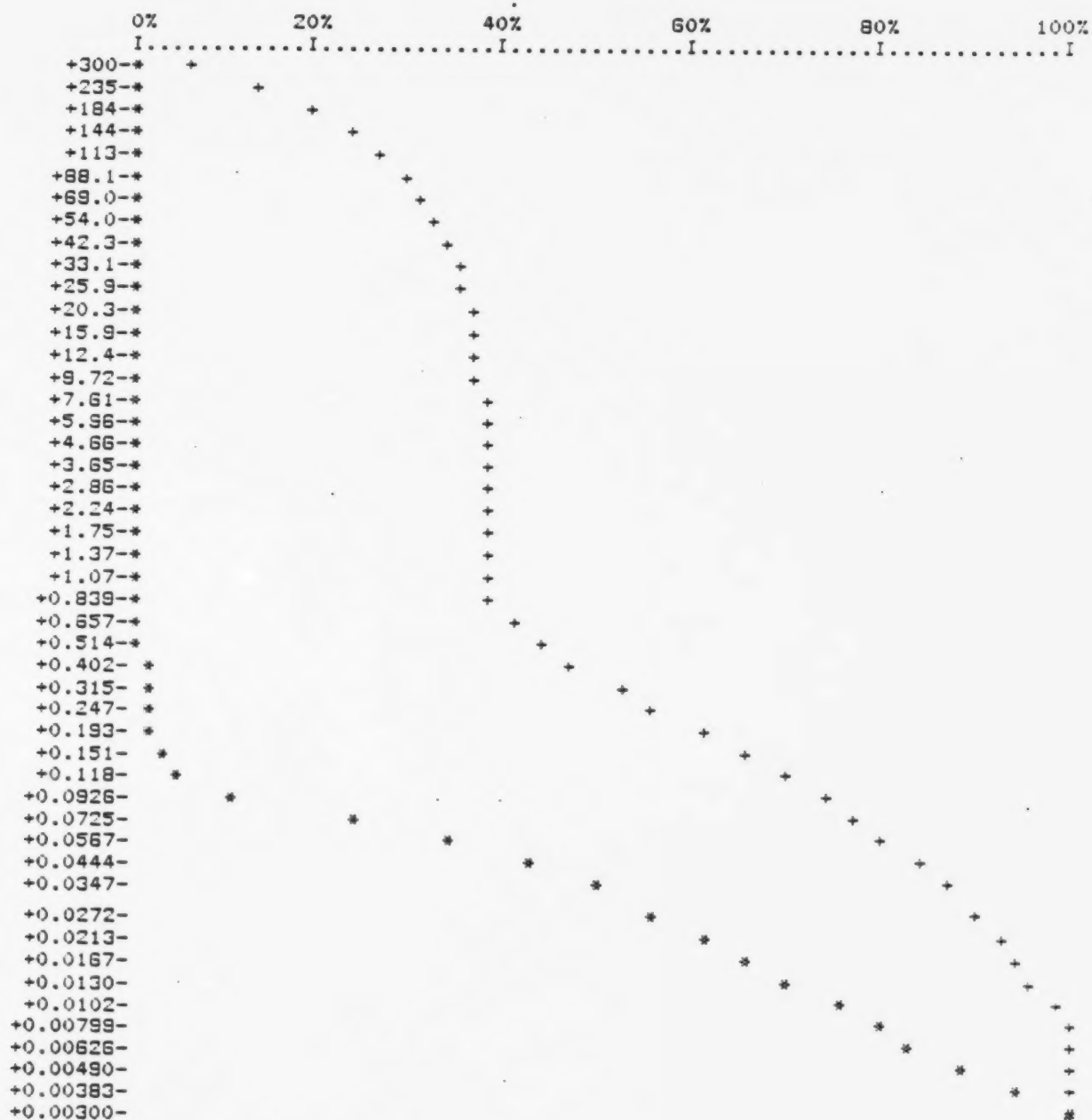
LP 8:28:7 8/14/85
HP 8:49:0 8/14/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SG-M/G	MEAN DIAMETER MICRO-M	DV
+20061.3	+0.0090	+0.1615	+19.2765	+0.0106	+0.0104
+25023.6	+0.0072	+0.1701	+23.5115	+0.0081	+0.0086
+29881.6	+0.0061	+0.1762	+27.2350	+0.0066	+0.0062
+40014.9	+0.0045	+0.1903	+37.8579	+0.0053	+0.0140
+49894.8	+0.0036	+0.2012	+48.5975	+0.0041	+0.0109
+59759.9	+0.0030	+0.2097	+58.8517	+0.0033	+0.0085
+49939.4	+0.0036	+0.2097	+58.8517	+0.0033	+0.0000
+40119.0	+0.0045	+0.2097	+58.8517	+0.0041	+0.0000
+30119.7	+0.0060	+0.2097	+58.8517	+0.0053	+0.0000
+25097.7	+0.0072	+0.2097	+58.8517	+0.0066	+0.0000
+20090.6	+0.0090	+0.2070	+57.4870	+0.0081	-0.0028
+15068.7	+0.0120	+0.2028	+55.8908	+0.0105	-0.0042
+12550.3	+0.0144	+0.2003	+55.1441	+0.0132	-0.0025
+10061.6	+0.0180	+0.1968	+54.2737	+0.0162	-0.0035
+7528.4	+0.0240	+0.1912	+53.2004	+0.0210	-0.0056
+5010.0	+0.0361	+0.1830	+52.1176	+0.0301	-0.0081
+3512.7	+0.0515	+0.1715	+51.0621	+0.0438	-0.0116
+2506.8	+0.0721	+0.1613	+50.4032	+0.0618	-0.0102
+1002.6	+0.1804	+0.1302	+49.4182	+0.1263	-0.0311
+750.7	+0.2409	+0.1191	+49.2073	+0.2107	-0.0111
+496.9	+0.3640	+0.1032	+48.9967	+0.3024	-0.0159
+396.3	+0.4563	+0.0959	+48.9258	+0.4101	-0.0073
+298.7	+0.6054	+0.0886	+48.8710	+0.5309	-0.0073
+248.9	+0.7268	+0.0821	+48.8317	+0.6661	-0.0065
+184.7	+0.9794	+0.0813	+48.8283	+0.8531	-0.0007
+147.4	+1.2269	+0.0803	+48.8244	+1.1032	-0.0011
+98.0	+1.8449	+0.0799	+48.8234	+1.5359	-0.0004
+74.3	+2.4342	+0.0795	+48.8227	+2.1395	-0.0004
+58.6	+3.0851	+0.0795	+48.8227	+2.7596	-0.0000
+50.3	+3.5922	+0.0791	+48.8222	+3.3387	-0.0004
+23.8	+7.6146	+0.0791	+48.8222	+5.6034	+0.0000

ONTARIO RESEARCH FPL
CONTROL 28 DAYS
PNTR NUMBER +45

LP 8:28:7 8/14/85
HP 8:49:0 8/14/85

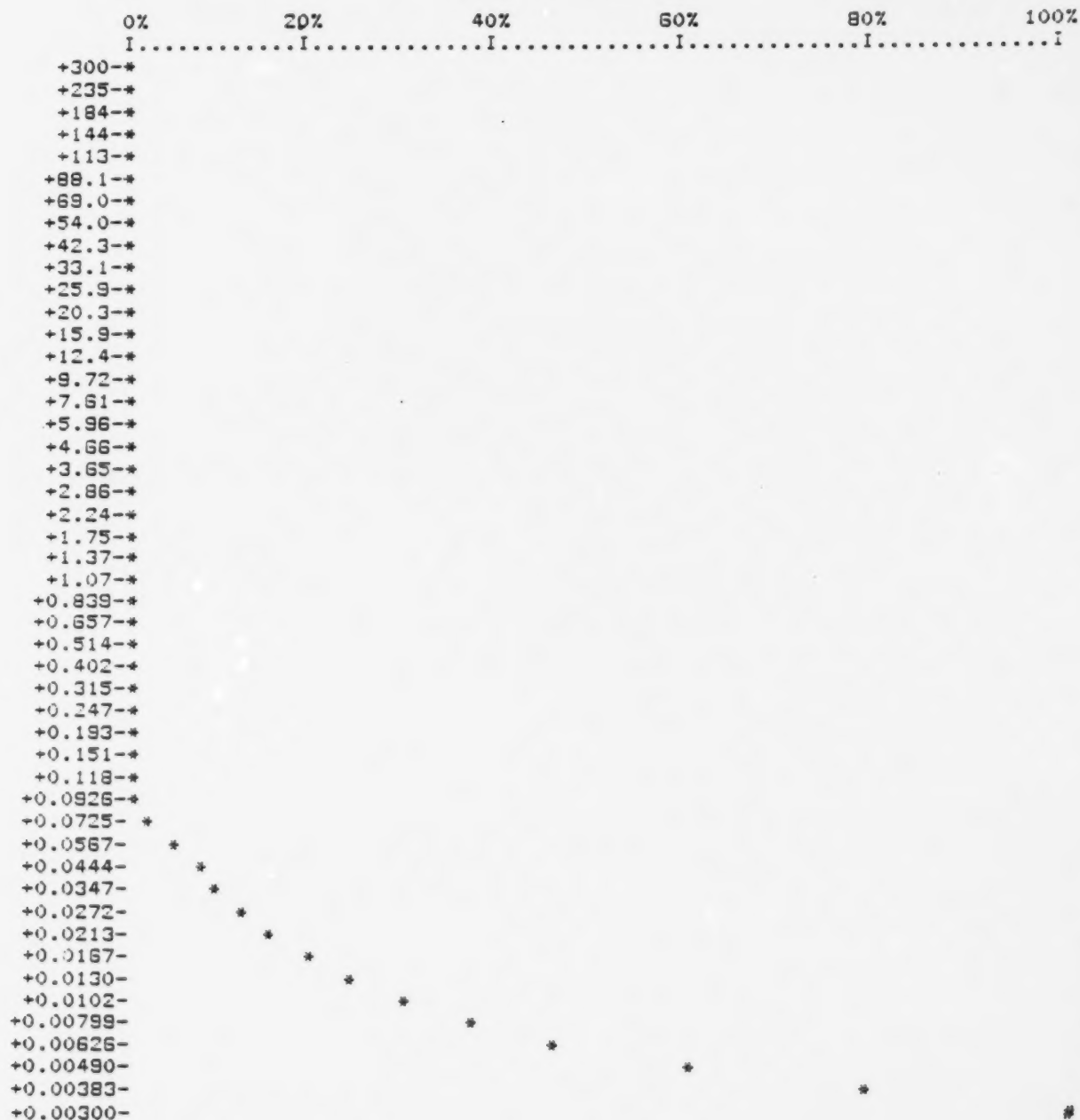
CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.2097



ONTARIO RESEARCH FPL
CONTROL 28 DAYS
PNTR NUMBER +45

LP 8:28:7 8/14/85
HP 8:49:0 8/14/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +58.8517



ONTARIO RESEARCH FPL
CONTROL 28 DAYS
PNTR NUMBER +45

LP 8:28:7 8/14/85
HP 8:49:0 8/14/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.233116E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--*					
+235--*					
+184--*					
+144--*					
+113--**					
+88.1--**					
+69.0--**					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--*					
+0.657--*					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--**					
+0.193--**					
+0.151--***					
+0.118--*****					
+0.0926--*****					
+0.0725--*****					
+0.0567--*****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*****					
+0.0130--*****					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
CONTROL 28 DAYS
PNTR NUMBER +45

LP 8:28:7 8/14/85
HP 8:49:0 8/14/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.107125E+002

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--					
+235--					
+184--					
+144--					
+113--					
+88.1--					
+69.0--					
+54.0--					
+42.3--					
+33.1--					
+25.9--					
+20.3--					
+15.9--					
+12.4--					
+9.72--					
+7.61--					
+5.96--					
+4.66--					
+3.65--					
+2.86--					
+2.24--					
+1.75--					
+1.37--					
+1.07--					
+0.839--					
+0.657--					
+0.514--					
+0.402--					
+0.315--					
+0.247--					
+0.193--					
+0.151--					
+0.118--					
+0.0926--					
+0.0725-----					
+0.0567-----					
+0.0444-----					
+0.0347-----					
+0.0272-----					
+0.0213-----					
+0.0167-----					
+0.0130-----					
+0.0102-----					
+0.00799-----					
+0.00626-----					
+0.00490-----					
+0.00383-----					
+0.00300--					

C2. 4000 (50) - 1,3,7,28d

ONTARIO RESEARCH FPL
4000 (50) 1
PNTR NUMBER +66

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+21.6300 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+1.0500 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+68.6500 G	INITIAL PRESSURE =	+0.9451 PSIA
PNTR+SAMPLE WEIGHT =	+69.7000 G	PORE DIAMETER =	+191.3750 MICRO-M
PNTR+SAMPLE+MERCURY =	+156.4000 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+7.2493 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.4196 CC/G
TOTAL PORE AREA =	+52.5128 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.5877 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0043 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0320 MICROMETERS
BULK DENSITY =	+1.2456 G/CC
APPARENT (SKELETAL) DENSITY =	+2.6097 G/CC

% CAPILLARY = +39.8767

PNTR = 52.5%

ONTARIO RESEARCH FPL
4000 (50) 1
PNTR NUMBER +66

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+191.3750	+0.0000	+0.0000	+191.3740	+0.0000
+2.0	+89.4468	+0.0025	+0.0001	+140.4110	+0.0025
+3.0	+60.9564	+0.0030	+0.0001	+75.2015	+0.0005
+4.0	+45.0499	+0.0035	+0.0001	+53.0031	+0.0005
+5.0	+36.1984	+0.0045	+0.0002	+40.6241	+0.0010
+5.9	+30.5158	+0.0045	+0.0002	+33.3571	+0.0000
+7.0	+25.8777	+0.0050	+0.0003	+28.1967	+0.0005
+8.0	+22.6282	+0.0055	+0.0004	+24.2529	+0.0005
+9.0	+20.1037	+0.0055	+0.0004	+21.3659	+0.0000
+10.0	+18.0859	+0.0061	+0.0005	+19.0948	+0.0005
+12.0	+15.0900	+0.0066	+0.0006	+16.5880	+0.0005
+13.9	+12.9865	+0.0071	+0.0008	+14.0383	+0.0005
+15.9	+11.3557	+0.0081	+0.0011	+12.1711	+0.0010
+17.9	+10.0971	+0.0086	+0.0013	+10.7264	+0.0005
+20.0	+9.0596	+0.0086	+0.0013	+9.5783	+0.0000
+28.9	+6.2565	+0.0088	+0.0014	+7.6580	+0.0002
+39.4	+4.5925	+0.0093	+0.0018	+5.4245	+0.0005
+49.9	+3.6279	+0.0104	+0.0028	+4.1102	+0.0010
+59.4	+3.0462	+0.0114	+0.0040	+3.3370	+0.0010
+80.8	+2.2377	+0.0144	+0.0086	+2.6419	+0.0030
+99.2	+1.8233	+0.0195	+0.0186	+2.0305	+0.0051
+124.3	+1.4550	+0.0396	+0.0678	+1.6392	+0.0202
+150.3	+1.2031	+0.0699	+0.1587	+1.3290	+0.0302
+175.2	+1.0324	+0.0991	+0.2633	+1.1177	+0.0292
+199.0	+0.9088	+0.1268	+0.3774	+0.9706	+0.0277
+237.8	+0.7606	+0.1741	+0.6043	+0.8347	+0.0473
+283.0	+0.6390	+0.2028	+0.7685	+0.6998	+0.0287
+318.2	+0.5685	+0.2124	+0.8321	+0.6037	+0.0096
+359.1	+0.5036	+0.2221	+0.9038	+0.5360	+0.0096
+399.2	+0.4531	+0.2286	+0.9589	+0.4783	+0.0066
+449.9	+0.4020	+0.2357	+1.0254	+0.4275	+0.0071
+499.7	+0.3619	+0.2428	+1.0997	+0.3819	+0.0071
+597.3	+0.3028	+0.2535	+1.2282	+0.3323	+0.0107
+698.9	+0.2588	+0.2627	+1.3587	+0.2808	+0.0092
+797.5	+0.2268	+0.2703	+1.4846	+0.2428	+0.0076
+995.8	+0.1816	+0.2826	+1.7246	+0.2042	+0.0123
+1250.7	+0.1446	+0.2939	+2.0011	+0.1631	+0.0113
+1500.7	+0.1205	+0.3021	+2.2494	+0.1326	+0.0082
+1745.8	+0.1036	+0.3088	+2.4884	+0.1121	+0.0067
+1995.9	+0.0906	+0.3134	+2.6809	+0.0971	+0.0047
+2487.9	+0.0727	+0.3217	+3.0872	+0.0817	+0.0083
+2994.1	+0.0604	+0.3270	+3.4021	+0.0666	+0.0052
+3981.9	+0.0454	+0.3359	+4.0728	+0.0529	+0.0089
+5010.2	+0.0361	+0.3416	+4.6401	+0.0408	+0.0058
+7454.1	+0.0243	+0.3516	+5.9579	+0.0302	+0.0099
+9957.6	+0.0182	+0.3584	+7.2354	+0.0212	+0.0068
+12446.2	+0.0145	+0.3645	+8.7496	+0.0163	+0.0062
+14934.8	+0.0121	+0.3697	+10.2913	+0.0133	+0.0051

ONTARIO RESEARCH FPL
4000 (50) 1
PNTR NUMBER +66

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20046.2	+0.0090	+0.3779	+13.3869	+0.0106	+0.0082
+24889.3	+0.0073	+0.3824	+15.6415	+0.0081	+0.0046
+29866.6	+0.0061	+0.3870	+18.3799	+0.0067	+0.0046
+40000.0	+0.0045	+0.3951	+24.4772	+0.0053	+0.0081
+49909.8	+0.0036	+0.4021	+31.3701	+0.0041	+0.0070
+59849.5	+0.0030	+0.4196	+52.5128	+0.0033	+0.0176
+50118.4	+0.0036	+0.4196	+52.5128	+0.0033	+0.0000
+40119.1	+0.0045	+0.4182	+51.0926	+0.0041	-0.0014
+30045.3	+0.0060	+0.4152	+48.7899	+0.0053	-0.0030
+25068.0	+0.0072	+0.4131	+47.5542	+0.0066	-0.0020
+20075.9	+0.0090	+0.4090	+45.5381	+0.0081	-0.0041
+15039.0	+0.0120	+0.4044	+43.7686	+0.0105	-0.0047
+12550.4	+0.0144	+0.4008	+42.6721	+0.0132	-0.0036
+10046.8	+0.0180	+0.3971	+41.7659	+0.0162	-0.0037
+7528.4	+0.0240	+0.3918	+40.7639	+0.0210	-0.0053
+5010.0	+0.0361	+0.3839	+39.7075	+0.0301	-0.0079
+3513.2	+0.0515	+0.3750	+38.8910	+0.0438	-0.0089
+2506.9	+0.0721	+0.3670	+38.3780	+0.0618	-0.0079
+1001.3	+0.1806	+0.3460	+37.7115	+0.1264	-0.0211
+751.3	+0.2407	+0.3402	+37.6020	+0.2107	-0.0058
+501.3	+0.3608	+0.3314	+37.4848	+0.3008	-0.0088
+398.7	+0.4536	+0.3257	+37.4293	+0.4072	-0.0057
+301.1	+0.6007	+0.3186	+37.3749	+0.5271	-0.0072
+249.3	+0.7253	+0.3140	+37.3472	+0.6630	-0.0046
+198.6	+0.9107	+0.3069	+37.3124	+0.8180	-0.0071
+149.0	+1.2134	+0.2811	+37.2155	+1.0621	-0.0257
+98.4	+1.8377	+0.2494	+37.1322	+1.5256	-0.0318
+75.5	+2.3957	+0.2141	+37.0656	+2.1167	-0.0352
+60.6	+2.9824	+0.1754	+37.0080	+2.6891	-0.0388
+50.2	+3.6042	+0.1381	+36.9627	+3.2933	-0.0372
+22.8	+7.9407	+0.0883	+36.9282	+5.7725	-0.0498

C3. 6000 (50) - 1,3,7,28d

ONTARIO RESEARCH FPL
6000 (50) 1
PNTR NUMBER +40

LP 8:59:56 7/17/85
HP 9:25:58 7/17/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.6000 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+69.3600 G	INITIAL PRESSURE =	+0.9524 PSIA
PNTR+SAMPLE WEIGHT =	+69.9600 G	PORE DIAMETER =	+189.9020 MICRO-M
PNTR+SAMPLE+MERCURY =	+155.7200 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.8059 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.3991 CC/G
TOTAL PORE AREA =	+40.3691 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.5071 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0058 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0395 MICROMETERS
BULK DENSITY =	+1.2792 G/CC
APPARENT (SKELETAL) DENSITY =	+2.6135 G/CC

% CAPILLARY = +62.3558

Porosity = 51.1 %

ONTARIO RESEARCH FPL
6000 (50) 1
PNTR NUMBER +40

LP 8:59:56 7/17/85
HP 9:25:58 7/17/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+191.3750	+0.0000	+0.0000	+190.6380	+0.0000
+2.0	+88.4850	+0.0022	+0.0001	+139.9300	+0.0022
+3.0	+61.2589	+0.0031	+0.0001	+74.8719	+0.0009
+4.0	+44.9678	+0.0035	+0.0001	+53.1133	+0.0004
+5.0	+36.0926	+0.0035	+0.0001	+40.5302	+0.0000
+6.0	+30.1432	+0.0044	+0.0002	+33.1179	+0.0009
+6.9	+26.1795	+0.0044	+0.0002	+28.1614	+0.0000
+8.0	+22.6697	+0.0044	+0.0002	+24.4246	+0.0000
+8.9	+20.3188	+0.0048	+0.0003	+21.4942	+0.0004
+10.0	+18.1391	+0.0048	+0.0003	+19.2289	+0.0000
+12.0	+15.0808	+0.0053	+0.0004	+16.6100	+0.0004
+14.0	+12.9253	+0.0053	+0.0004	+14.0030	+0.0000
+15.9	+11.3557	+0.0057	+0.0006	+12.1405	+0.0004
+18.0	+10.0600	+0.0062	+0.0007	+10.7079	+0.0004
+20.0	+9.0596	+0.0062	+0.0008	+9.5598	+0.0000
+26.8	+6.2897	+0.0062	+0.0008	+7.6746	+0.0000
+38.7	+4.6712	+0.0062	+0.0008	+5.4804	+0.0000
+48.8	+3.7098	+0.0066	+0.0012	+4.1905	+0.0005
+58.6	+3.0841	+0.0067	+0.0012	+3.3970	+0.0000
+78.8	+2.2957	+0.0076	+0.0026	+2.6899	+0.0009
+99.4	+1.8188	+0.0080	+0.0035	+2.0573	+0.0005
+123.5	+1.4650	+0.0094	+0.0067	+1.6419	+0.0013
+148.7	+1.2162	+0.0125	+0.0160	+1.3406	+0.0031
+173.3	+1.0438	+0.0204	+0.0441	+1.1300	+0.0079
+198.8	+0.9098	+0.0486	+0.1593	+0.9768	+0.0281
+238.0	+0.7601	+0.1347	+0.5719	+0.8350	+0.0861
+278.8	+0.6488	+0.1764	+0.8090	+0.7044	+0.0418
+320.7	+0.5640	+0.1901	+0.8991	+0.6064	+0.0137
+359.7	+0.5029	+0.2002	+0.9752	+0.5334	+0.0101
+398.7	+0.4537	+0.2086	+1.0453	+0.4783	+0.0084
+448.4	+0.4033	+0.2183	+1.1360	+0.4285	+0.0097
+498.2	+0.3630	+0.2259	+1.2144	+0.3832	+0.0075
+595.8	+0.3036	+0.2382	+1.3631	+0.3333	+0.0124
+696.3	+0.2597	+0.2480	+1.5016	+0.2817	+0.0098
+798.8	+0.2264	+0.2564	+1.6404	+0.2431	+0.0084
+996.0	+0.1816	+0.2693	+1.8932	+0.2040	+0.0129
+1251.9	+0.1445	+0.2814	+2.1885	+0.1630	+0.0120
+1500.9	+0.1205	+0.2894	+2.4319	+0.1325	+0.0081
+1741.2	+0.1039	+0.2957	+2.6559	+0.1122	+0.0063
+1995.1	+0.0907	+0.3007	+2.8599	+0.0973	+0.0050
+2488.5	+0.0727	+0.3092	+3.2791	+0.0817	+0.0086
+2995.7	+0.0604	+0.3151	+3.6334	+0.0665	+0.0059
+3966.2	+0.0456	+0.3237	+4.2840	+0.0530	+0.0086
+5009.3	+0.0361	+0.3301	+4.9075	+0.0409	+0.0064
+7468.1	+0.0242	+0.3405	+6.2917	+0.0302	+0.0104
+9956.7	+0.0182	+0.3478	+7.6565	+0.0212	+0.0072
+12460.2	+0.0145	+0.3532	+8.9791	+0.0163	+0.0054
+14933.9	+0.0121	+0.3581	+10.4575	+0.0133	+0.0049

ONTARIO RESEARCH FPL
G000 (50) 1
PNTR NUMBER +40

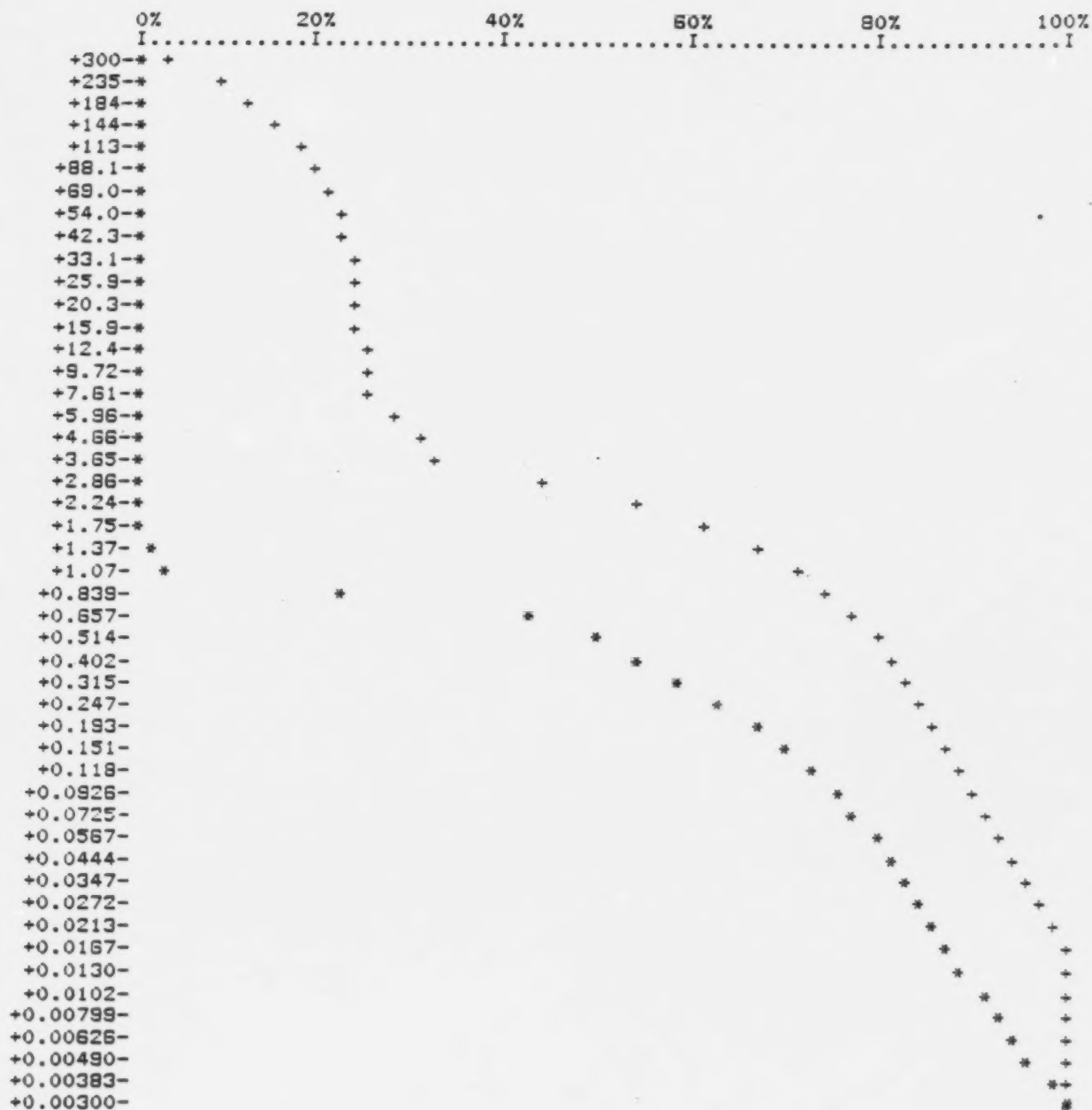
LP 8:59:56 7/17/85
HP 9:25:58 7/17/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20075.0	+0.0090	+0.3665	+13.6606	+0.0106	+0.0085
+24873.5	+0.0073	+0.3723	+16.4927	+0.0081	+0.0058
+29850.7	+0.0061	+0.3767	+19.1455	+0.0067	+0.0044
+40043.6	+0.0045	+0.3860	+26.1302	+0.0053	+0.0092
+49938.6	+0.0036	+0.3930	+33.0163	+0.0041	+0.0070
+59759.0	+0.0030	+0.3991	+40.3692	+0.0033	+0.0061
+50013.0	+0.0036	+0.3991	+40.3692	+0.0033	+0.0000
+40162.8	+0.0045	+0.3991	+40.3692	+0.0041	+0.0000
+30014.4	+0.0060	+0.3991	+40.3692	+0.0053	+0.0000
+25037.1	+0.0072	+0.3991	+40.3692	+0.0066	+0.0000
+20059.8	+0.0090	+0.3991	+40.3692	+0.0081	+0.0000
+15067.7	+0.0120	+0.3991	+40.3692	+0.0105	+0.0000
+12549.2	+0.0144	+0.3991	+40.3692	+0.0132	+0.0000
+10045.7	+0.0180	+0.3961	+39.6289	+0.0162	-0.0030
+7527.3	+0.0240	+0.3910	+38.6707	+0.0210	-0.0050
+5008.9	+0.0361	+0.3828	+37.5734	+0.0301	-0.0082
+3513.2	+0.0515	+0.3719	+36.5799	+0.0438	-0.0109
+2506.8	+0.0721	+0.3641	+36.0753	+0.0618	-0.0078
+1000.4	+0.1808	+0.3418	+35.3688	+0.1265	-0.0223
+747.5	+0.2420	+0.3350	+35.2403	+0.2114	-0.0068
+496.5	+0.3643	+0.3255	+35.1155	+0.3031	-0.0095
+395.9	+0.4568	+0.3193	+35.0546	+0.4105	-0.0063
+297.3	+0.6083	+0.3117	+34.9977	+0.5325	-0.0076
+248.6	+0.7274	+0.3042	+34.9527	+0.6679	-0.0075
+183.1	+0.9878	+0.2905	+34.8888	+0.8576	-0.0137
+148.2	+1.2200	+0.2738	+34.8282	+1.1039	-0.0167
+98.8	+1.8304	+0.2408	+34.7417	+1.5252	-0.0330
+74.5	+2.4288	+0.2025	+34.6699	+2.1296	-0.0382
+59.8	+3.0245	+0.1634	+34.6125	+2.7266	-0.0391
+49.9	+3.6226	+0.1300	+34.5723	+3.3235	-0.0334
+23.6	+7.6617	+0.1019	+34.5524	+5.6422	-0.0281

ONTARIO RESEARCH FPL
6000 (50) 1
PNTR NUMBER +40

LP 8:59:56 7/17/85
HP 9:25:58 7/17/85

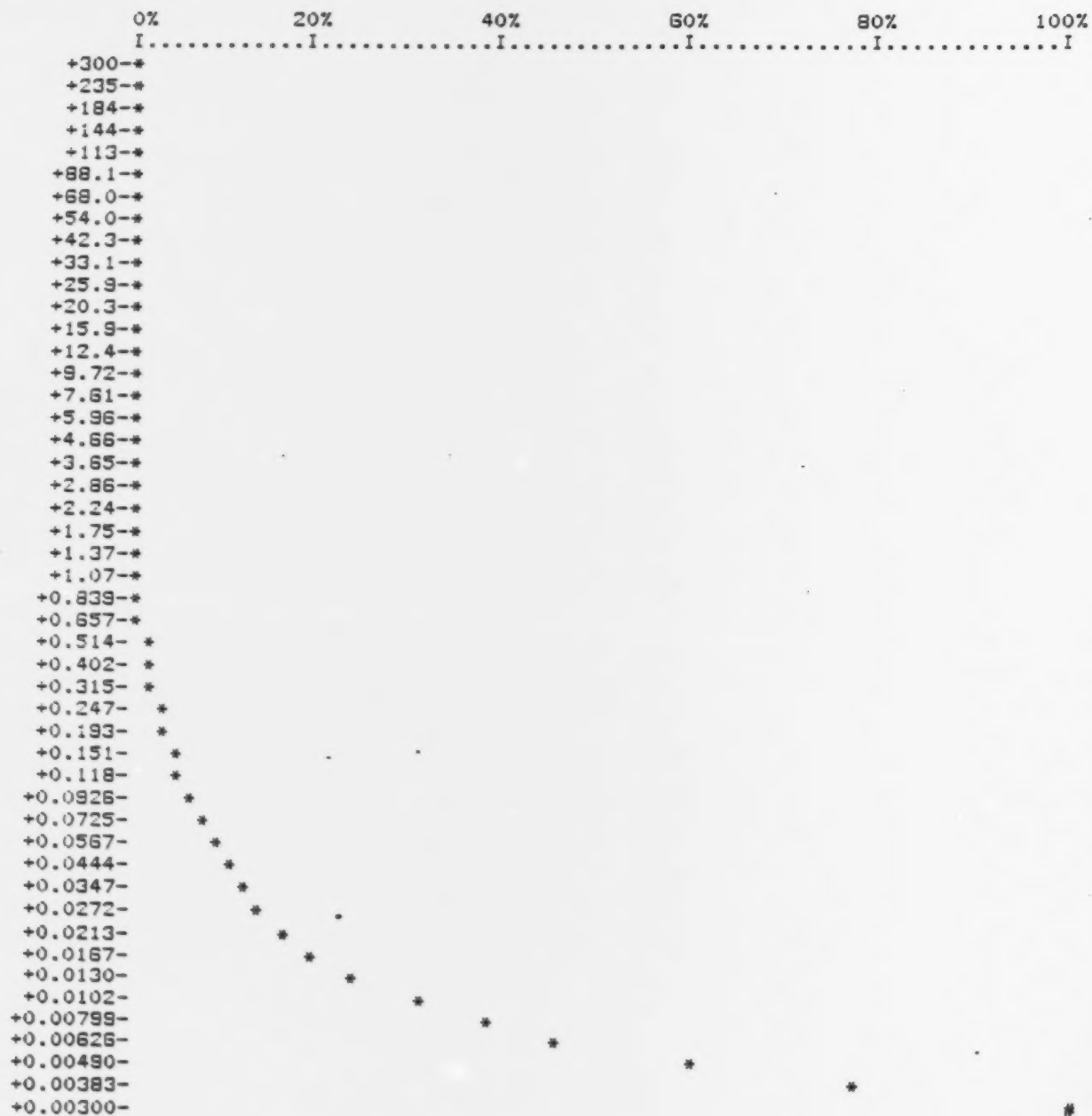
CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.3991



ONTARIO RESEARCH FPL
6000 (50) 1
PNTR NUMBER +40

LP 8:59:56 7/17/85
HP 9:25:58 7/17/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +40.3691



ONTARIO RESEARCH FPL
6000 (50) 1
PNTR NUMBER +40

LP 8:59:56 7/17/85
HP 9:25:58 7/17/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.554460E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--*					
+235--*					
+184--*					
+144--*					
+113--**					
+88.1--**					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--***					
+1.07--*****					
+0.839--*****					
+0.657--*****					
+0.514--*****					
+0.402--*****					
+0.315--*****					
+0.247--*****					
+0.193--*****					
+0.151--*****					
+0.118--*****					
+0.0926--*****					
+0.0725--*****					
+0.0567--*****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*****					
+0.0130--*****					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
6000 (50) 1
PNTR NUMBER +40

LP 8:59:56 7/17/85
HP 9:25:58 7/17/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.690930E+001

0%	20%	40%	60%	80%	100%
I.....I.....I.....I.....I.....I.....I					
+300--*					
+235--*					
+184--*					
+144--*					
+113--*					
+88.1--*					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--***					
+0.657--***					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--*					
+0.193--**					
+0.151--***					
+0.118--**					
+0.0926--**					
+0.0725--****					
+0.0567--****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*****					
+0.0130--*****					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
6000 (50) 3
PNTR NUMBER +45

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+1.1100 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+72.9300 G	INITIAL PRESSURE =	+0.9670 PSIA
PNTR+SAMPLE WEIGHT =	+74.0400 G	PORE DIAMETER =	+187.0250 MICRO-M
PNTR+SAMPLE+MERCURY =	+157.5400 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.9712 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.3247 CC/G
TOTAL PORE AREA =	+49.1264 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.1564 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0064 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0264 MICROMETERS
BULK DENSITY =	+1.3852 G/CC
APPARENT (SKELETAL) DENSITY =	+2.5174 G/CC

% CAPILLARY = +93.8311 ****

Porosity = 45.0%

ONTARIO RESEARCH FPL
G000 (50) 3
PNTR NUMBER +45

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+1.0	+187.0250	+0.0000	+0.0000	+187.0250	+0.0000
+2.0	+89.1239	+0.0014	+0.0000	+138.0740	+0.0014
+3.0	+61.1072	+0.0019	+0.0001	+75.1155	+0.0005
+4.0	+45.0499	+0.0024	+0.0001	+53.0785	+0.0005
+4.9	+36.6281	+0.0026	+0.0001	+40.8389	+0.0002
+5.9	+30.4782	+0.0029	+0.0002	+33.5531	+0.0002
+6.9	+26.1242	+0.0029	+0.0002	+28.3011	+0.0000
+8.0	+22.6489	+0.0031	+0.0002	+24.3865	+0.0002
+8.9	+20.3021	+0.0036	+0.0003	+21.4755	+0.0005
+10.0	+18.0992	+0.0036	+0.0003	+19.2006	+0.0000
+11.9	+15.1922	+0.0036	+0.0003	+16.6457	+0.0000
+14.0	+12.9253	+0.0038	+0.0004	+14.0587	+0.0002
+15.9	+11.3505	+0.0040	+0.0004	+12.1379	+0.0002
+17.9	+10.0929	+0.0043	+0.0005	+10.7217	+0.0002
+20.0	+9.0596	+0.0045	+0.0006	+9.5762	+0.0002
+28.8	+6.2771	+0.0045	+0.0006	+7.6683	+0.0000
+39.1	+4.6289	+0.0045	+0.0006	+5.4530	+0.0000
+50.1	+3.6075	+0.0045	+0.0006	+4.1182	+0.0000
+58.8	+3.0733	+0.0045	+0.0006	+3.3404	+0.0000
+79.7	+2.2705	+0.0046	+0.0007	+2.6719	+0.0000
+101.3	+1.7847	+0.0048	+0.0012	+2.0276	+0.0003
+123.7	+1.4623	+0.0051	+0.0018	+1.6235	+0.0003
+150.0	+1.2059	+0.0053	+0.0026	+1.3341	+0.0003
+174.2	+1.0381	+0.0061	+0.0051	+1.1220	+0.0007
+200.1	+0.9037	+0.0063	+0.0072	+0.9709	+0.0005
+238.6	+0.7581	+0.0118	+0.0324	+0.8309	+0.0052
+283.2	+0.6387	+0.0557	+0.2841	+0.6984	+0.0439
+319.1	+0.5668	+0.0750	+0.4119	+0.6028	+0.0192
+360.9	+0.5012	+0.0900	+0.5241	+0.5340	+0.0150
+397.9	+0.4546	+0.1000	+0.6077	+0.4779	+0.0100
+446.6	+0.4050	+0.1095	+0.6963	+0.4298	+0.0095
+497.3	+0.3637	+0.1173	+0.7781	+0.3843	+0.0079
+599.7	+0.3016	+0.1288	+0.9158	+0.3326	+0.0114
+700.2	+0.2583	+0.1374	+1.0386	+0.2799	+0.0086
+800.7	+0.2259	+0.1443	+1.1531	+0.2421	+0.0069
+999.8	+0.1809	+0.1551	+1.3649	+0.2034	+0.0108
+1251.7	+0.1445	+0.1659	+1.6299	+0.1627	+0.0108
+1495.8	+0.1209	+0.1740	+1.8757	+0.1327	+0.0082
+1739.9	+0.1039	+0.1810	+2.1232	+0.1124	+0.0070
+1988.9	+0.0909	+0.1870	+2.3696	+0.0974	+0.0060
+2485.0	+0.0728	+0.1966	+2.8393	+0.0819	+0.0096
+2993.1	+0.0604	+0.2055	+3.3728	+0.0666	+0.0089
+3980.5	+0.0454	+0.2194	+4.4247	+0.0529	+0.0139
+4993.7	+0.0362	+0.2290	+5.3663	+0.0408	+0.0096
+7467.2	+0.0242	+0.2467	+7.7158	+0.0302	+0.0178
+9955.7	+0.0182	+0.2590	+10.0216	+0.0212	+0.0122
+12444.2	+0.0145	+0.2681	+12.2460	+0.0163	+0.0091
+14932.8	+0.0121	+0.2750	+14.3276	+0.0133	+0.0069

ONTARIO RESEARCH FPL
6000 (50) 3
PNTR NUMBER +45

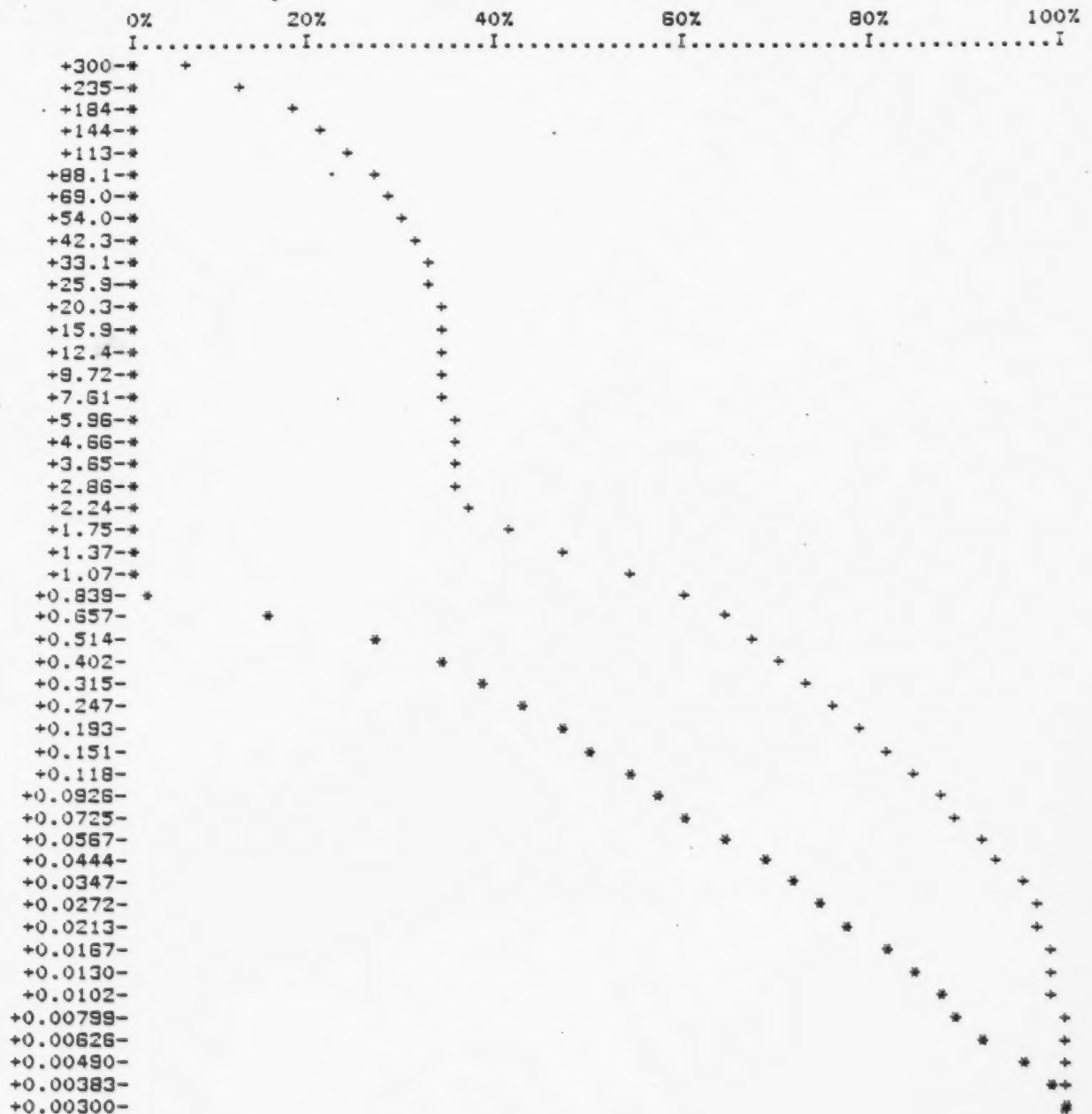
LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20059.0	+0.0090	+0.2850	+18.1256	+0.0106	+0.0100
+24872.3	+0.0073	+0.2919	+21.5214	+0.0081	+0.0069
+29983.6	+0.0060	+0.2995	+26.0988	+0.0067	+0.0076
+40042.3	+0.0045	+0.3119	+35.4648	+0.0053	+0.0123
+49907.4	+0.0036	+0.3197	+43.1518	+0.0041	+0.0078
+59817.2	+0.0030	+0.3247	+49.1264	+0.0033	+0.0050
+49788.1	+0.0036	+0.3245	+48.8660	+0.0033	-0.0002
+40131.6	+0.0045	+0.3240	+48.4104	+0.0041	-0.0005
+30042.9	+0.0060	+0.3233	+47.8650	+0.0053	-0.0007
+25065.6	+0.0072	+0.3230	+47.7124	+0.0066	-0.0003
+20088.3	+0.0090	+0.3221	+47.2291	+0.0081	-0.0010
+15051.4	+0.0120	+0.3206	+46.6646	+0.0105	-0.0015
+12547.9	+0.0144	+0.3198	+46.4344	+0.0132	-0.0008
+10029.4	+0.0180	+0.3183	+46.0657	+0.0162	-0.0015
+7525.9	+0.0240	+0.3156	+45.5482	+0.0210	-0.0027
+5007.6	+0.0361	+0.3088	+44.6394	+0.0301	-0.0068
+3509.3	+0.0515	+0.2986	+43.7128	+0.0438	-0.0102
+2502.1	+0.0723	+0.2882	+43.0417	+0.0619	-0.0104
+998.5	+0.1811	+0.2553	+42.0010	+0.1267	-0.0330
+748.6	+0.2416	+0.2456	+41.8193	+0.2114	-0.0096
+497.7	+0.3634	+0.2308	+41.6230	+0.3025	-0.0148
+396.2	+0.4564	+0.2234	+41.5506	+0.4099	-0.0074
+298.7	+0.6055	+0.2134	+41.4751	+0.5310	-0.0100
+248.0	+0.7293	+0.2069	+41.4365	+0.6674	-0.0064
+192.2	+0.9410	+0.1867	+41.3397	+0.8351	-0.0202
+148.0	+1.2223	+0.1639	+41.2553	+1.0817	-0.0228
+99.6	+1.8154	+0.1294	+41.1646	+1.5189	-0.0345
+73.6	+2.4582	+0.1159	+41.1392	+2.1368	-0.0135
+59.1	+3.0610	+0.1147	+41.1375	+2.7596	-0.0012
+49.2	+3.6759	+0.1142	+41.1369	+3.3684	-0.0005
+22.0	+8.2353	+0.1132	+41.1362	+5.9556	-0.0010

ONTARIO RESEARCH FPL
6000 (50) 3
PNTR NUMBER +45

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

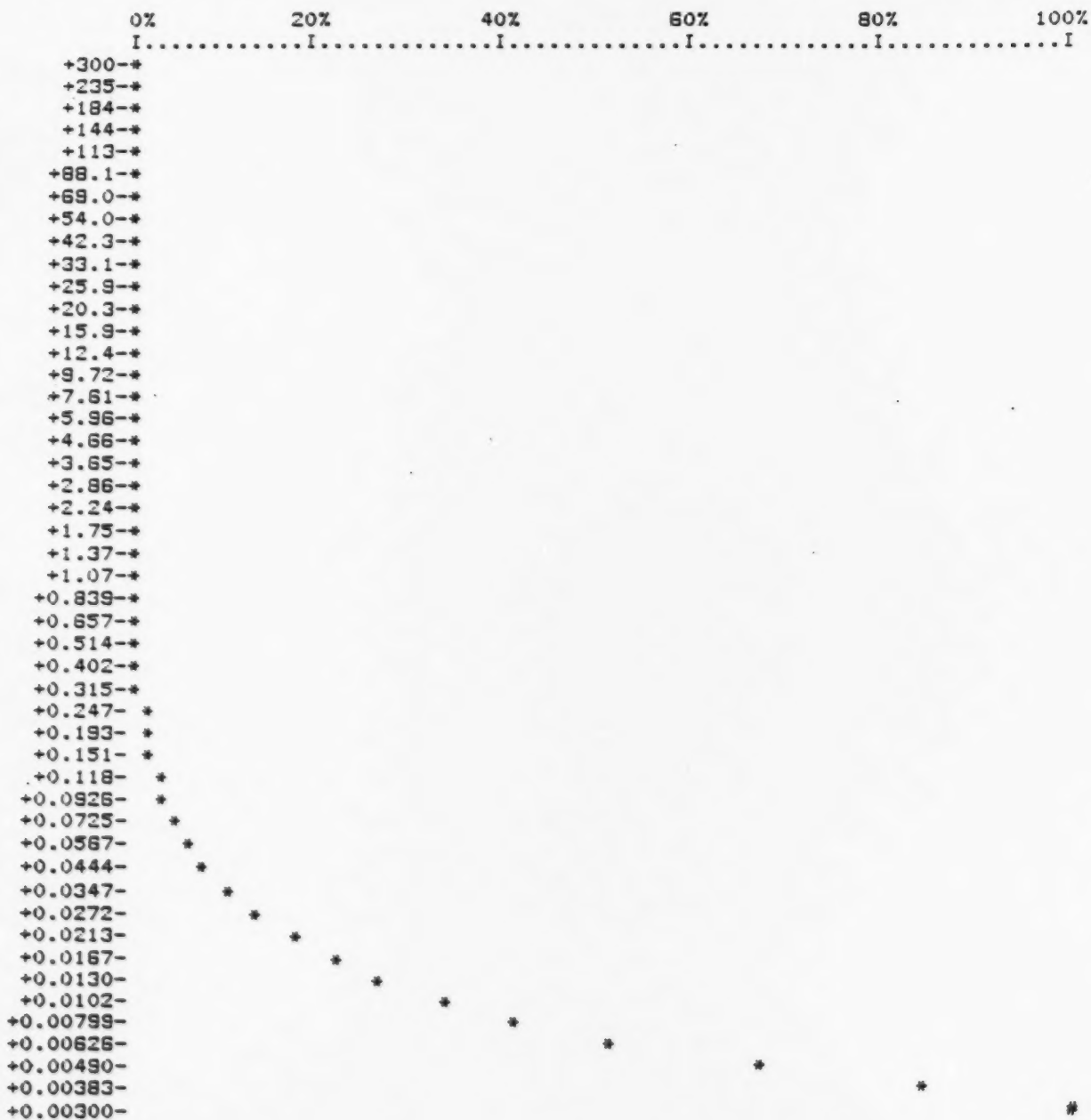
CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.3247



ONTARIO RESEARCH FPL
6000 (50) 3
PNTR NUMBER +45

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +49.1264



ONTARIO RESEARCH FPL
6000 (50) 3
PNTR NUMBER +45

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.380228E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--*					
+235--*					
+184--*					
+144--*					
+113--**					
+88.1-***					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839-*****					
+0.657-*****					
+0.514-*****					
+0.402-*****					
+0.315-*****					
+0.247-*****					
+0.193-*****					
+0.151-*****					
+0.118-*****					
+0.0926-*****					
+0.0725-*****					
+0.0567-*****					
+0.0444-*****					
+0.0347-*****					
+0.0272-*****					
+0.0213-*****					
+0.0167-*****					
+0.0130-*****					
+0.0102-*****					
+0.00799-*****					
+0.00626-*****					
+0.00490-*****					
+0.00383-*****					
+0.00300--*					

LP 13:27:21 7/18/85
HP 14:16:57 7/18/85

0%	20%	40%	60%	80%	100%
I.....I.....I.....I.....I.....I					
+300--*					
+235--*					
+184--*					
+144--*					
+113--*					
+88.1--*					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--*					
+0.657--**					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--*					
+0.193--**					
+0.151--**					
+0.118--**					
+0.0926--**					
+0.0725-****					
+0.0567-*****					
+0.0444-*****					
+0.0347-*****					
+0.0272-*****					
+0.0213-*****					
+0.0167-*****					
+0.0130-*****					
+0.0102-*****					
+0.00799-*****					
+0.00626-*****					
+0.00490-*****					
+0.00383-*****					
+0.00300--*					

ONTARIO RESEARCH FPL
G000 (50) 7
PNTR NUMBER +45

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.8300 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+72.8600 G	INITIAL PRESSURE =	+0.9451 PSIA
PNTR+SAMPLE WEIGHT =	+73.6900 G	PORE DIAMETER =	+191.3750 MICRO-M
PNTR+SAMPLE+MERCURY =	+160.3700 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.9712 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.3079 CC/G
TOTAL PORE AREA =	+80.7572 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.0492 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0046 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0152 MICROMETERS
BULK DENSITY =	+1.4655 G/CC
APPARENT (SKELETAL) DENSITY =	+2.6703 G/CC

% CAPILLARY = +66.5412

Porosity = 45.1%

ONTARIO RESEARCH FPL
G000 (50) 7
PNTR NUMBER +45

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+191.3750	+0.0000	+0.0000	+191.3740	+0.0000
+2.0	+89.4468	+0.0019	+0.0001	+140.4110	+0.0019
+3.0	+60.0665	+0.0029	+0.0001	+74.7566	+0.0010
+4.0	+45.0499	+0.0032	+0.0001	+52.5581	+0.0003
+4.9	+36.6825	+0.0038	+0.0002	+40.8661	+0.0006
+6.0	+30.1432	+0.0038	+0.0002	+33.4128	+0.0000
+7.0	+25.8506	+0.0038	+0.0002	+27.9969	+0.0000
+8.0	+22.6697	+0.0038	+0.0002	+24.2601	+0.0000
+9.0	+20.1529	+0.0045	+0.0003	+21.4113	+0.0006
+10.0	+18.1391	+0.0045	+0.0003	+19.1460	+0.0000
+12.0	+15.0993	+0.0048	+0.0004	+16.6192	+0.0003
+13.9	+12.9728	+0.0051	+0.0005	+14.0360	+0.0003
+15.9	+11.3609	+0.0051	+0.0005	+12.1669	+0.0000
+18.0	+10.0641	+0.0054	+0.0006	+10.7125	+0.0003
+20.0	+9.0596	+0.0057	+0.0007	+9.5618	+0.0003
+28.7	+6.3085	+0.0057	+0.0007	+7.6840	+0.0000
+38.7	+4.6727	+0.0057	+0.0007	+5.4906	+0.0000
+48.7	+3.7105	+0.0058	+0.0008	+4.1916	+0.0000
+59.7	+3.0280	+0.0061	+0.0011	+3.3693	+0.0003
+80.5	+2.2458	+0.0064	+0.0017	+2.6369	+0.0003
+99.1	+1.8257	+0.0068	+0.0023	+2.0358	+0.0003
+125.4	+1.4419	+0.0071	+0.0031	+1.6338	+0.0003
+148.7	+1.2161	+0.0084	+0.0070	+1.3290	+0.0013
+173.7	+1.0412	+0.0087	+0.0082	+1.1287	+0.0003
+198.9	+0.9093	+0.0091	+0.0096	+0.9753	+0.0003
+238.6	+0.7582	+0.0101	+0.0144	+0.8337	+0.0010
+280.9	+0.6439	+0.0117	+0.0236	+0.7010	+0.0016
+319.9	+0.5653	+0.0130	+0.0322	+0.6046	+0.0013
+360.9	+0.5011	+0.0146	+0.0444	+0.5332	+0.0016
+402.9	+0.4489	+0.0175	+0.0687	+0.4750	+0.0029
+448.8	+0.4030	+0.0223	+0.1137	+0.4259	+0.0048
+498.5	+0.3628	+0.0290	+0.1838	+0.3829	+0.0067
+599.0	+0.3019	+0.0414	+0.3336	+0.3324	+0.0125
+696.6	+0.2596	+0.0526	+0.4928	+0.2808	+0.0112
+797.1	+0.2269	+0.0625	+0.6556	+0.2433	+0.0099
+997.2	+0.1814	+0.0775	+0.9503	+0.2041	+0.0150
+1252.0	+0.1445	+0.0913	+1.2886	+0.1629	+0.0138
+1494.1	+0.1210	+0.1016	+1.5980	+0.1328	+0.0103
+1744.1	+0.1037	+0.1100	+1.8955	+0.1124	+0.0084
+1993.1	+0.0907	+0.1173	+2.1996	+0.0972	+0.0074
+2488.8	+0.0727	+0.1312	+2.8756	+0.0817	+0.0138
+2983.6	+0.0606	+0.1411	+3.4740	+0.0666	+0.0100
+3981.8	+0.0454	+0.1582	+4.7588	+0.0530	+0.0170
+4980.2	+0.0363	+0.1697	+5.8923	+0.0409	+0.0116
+7468.6	+0.0242	+0.1913	+8.7361	+0.0303	+0.0215
+9957.1	+0.0182	+0.2076	+11.8202	+0.0212	+0.0163
+12445.6	+0.0145	+0.2213	+15.1836	+0.0163	+0.0137
+14949.0	+0.0121	+0.2316	+18.2551	+0.0133	+0.0102

ONTARIO RESEARCH FPL
6000 (50) 7
PNTR NUMBER +45

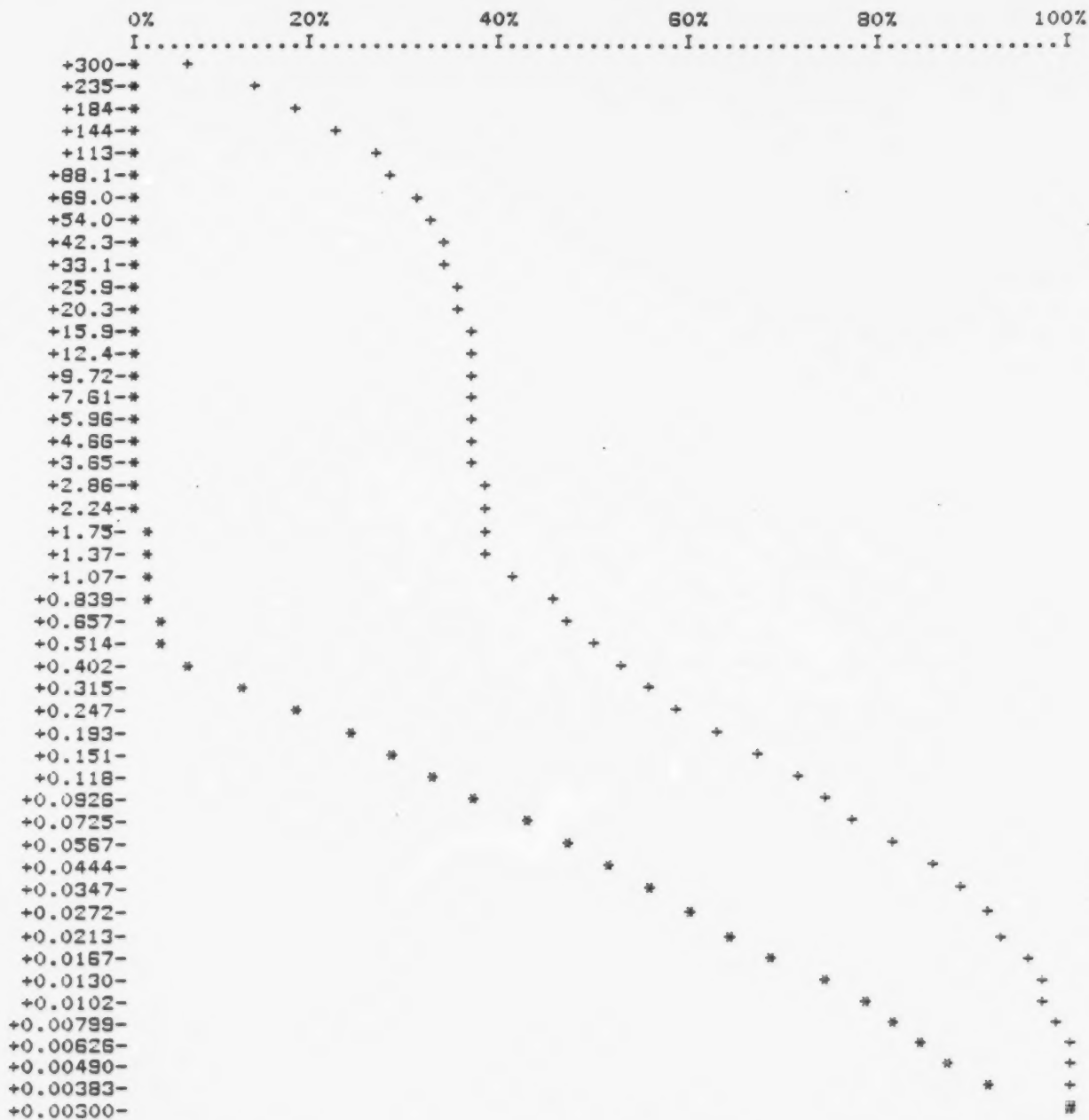
LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20030.5	+0.0090	+0.2453	+23.4544	+0.0106	+0.0137
+24992.8	+0.0072	+0.2539	+27.6901	+0.0081	+0.0086
+29970.0	+0.0060	+0.2609	+31.9125	+0.0066	+0.0070
+39984.1	+0.0045	+0.2727	+40.8186	+0.0053	+0.0118
+49849.2	+0.0036	+0.2838	+51.7081	+0.0041	+0.0111
+60116.5	+0.0030	+0.3079	+80.7572	+0.0033	+0.0241
+49878.7	+0.0036	+0.3079	+80.7572	+0.0033	+0.0000
+40117.9	+0.0045	+0.3079	+80.7572	+0.0041	+0.0000
+30088.8	+0.0060	+0.3066	+79.8192	+0.0053	-0.0012
+25051.9	+0.0072	+0.3053	+79.0391	+0.0066	-0.0013
+20059.8	+0.0090	+0.3024	+77.6111	+0.0081	-0.0029
+15067.6	+0.0120	+0.2989	+76.2523	+0.0105	-0.0036
+12534.3	+0.0144	+0.2953	+75.1756	+0.0132	-0.0036
+10060.6	+0.0180	+0.2911	+74.1337	+0.0162	-0.0042
+7542.2	+0.0240	+0.2843	+72.8345	+0.0210	-0.0068
+5009.0	+0.0361	+0.2713	+71.1106	+0.0300	-0.0129
+3512.7	+0.0515	+0.2543	+69.5517	+0.0438	-0.0171
+2508.9	+0.0721	+0.2381	+68.5086	+0.0618	-0.0161
+1003.8	+0.1802	+0.1956	+67.1608	+0.1261	-0.0425
+748.1	+0.2418	+0.1828	+66.9173	+0.2110	-0.0128
+499.1	+0.3624	+0.1668	+66.7049	+0.3021	-0.0160
+396.6	+0.4560	+0.1584	+66.6234	+0.4092	-0.0083
+299.1	+0.6048	+0.1488	+66.5510	+0.5304	-0.0096
+247.3	+0.7312	+0.1428	+66.5147	+0.6680	-0.0061
+197.6	+0.9153	+0.1364	+66.4836	+0.8233	-0.0064
+149.4	+1.2109	+0.1214	+66.4273	+1.0631	-0.0150
+99.9	+1.8095	+0.1179	+66.4179	+1.5102	-0.0035
+73.0	+2.4776	+0.1169	+66.4161	+2.1436	-0.0010
+58.6	+3.0841	+0.1166	+66.4156	+2.7809	-0.0003
+47.7	+3.7951	+0.1162	+66.4152	+3.4396	-0.0003
+21.7	+8.3507	+0.1153	+66.4146	+6.0729	-0.0010

ONTARIO RESEARCH FPL
6000 (50) 7
PNTR NUMBER +45

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

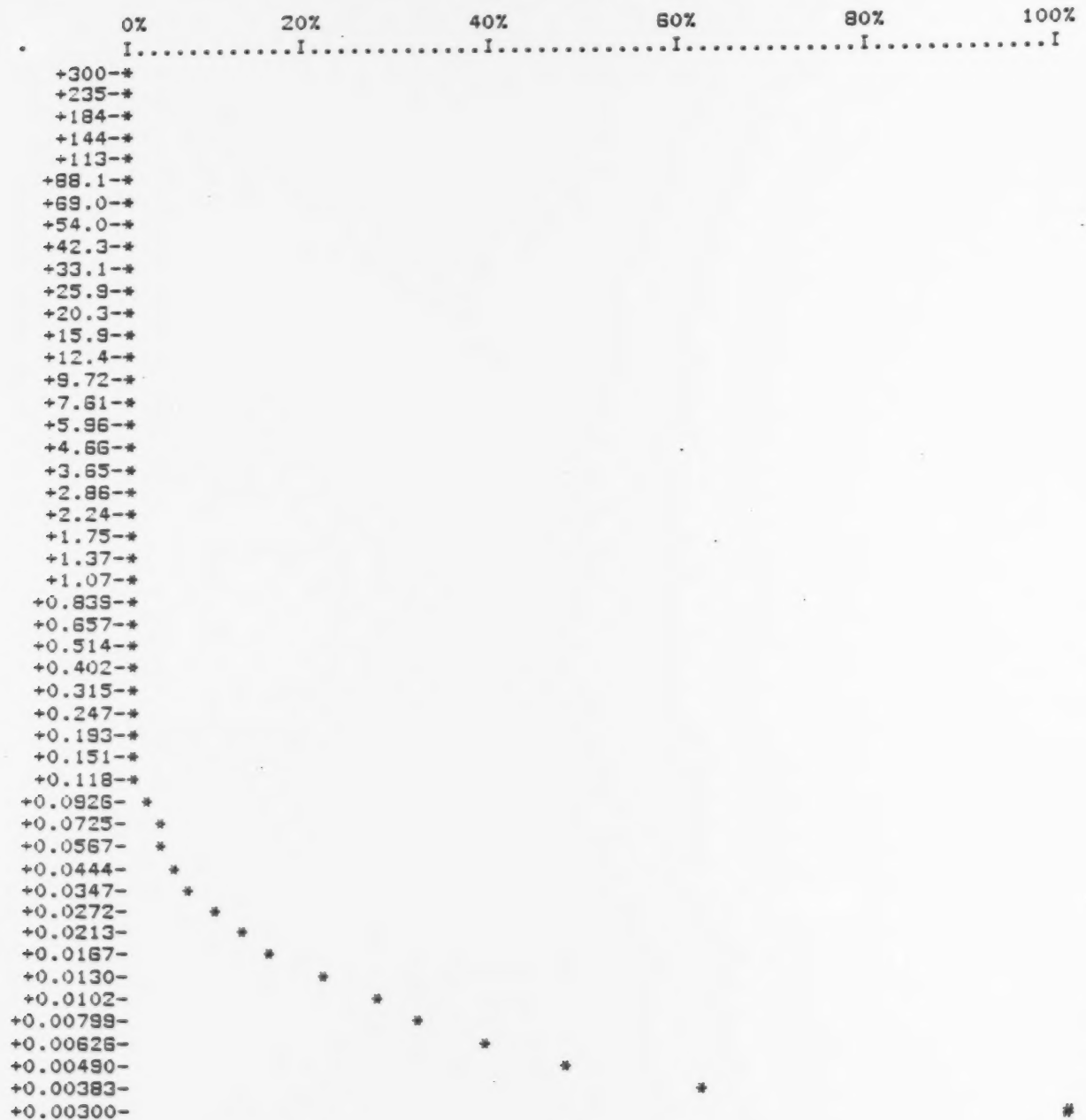
CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.3079



ONTARIO RESEARCH FPL
6000 (50) 7
PNTR NUMBER +45

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +80.7572



ONTARIO RESEARCH FPL
6000 (50) 7
PNTR NUMBER +45

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.190682E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--					
+235--					
+184--					
+144----					
+113-----					
+88.1-----					
+69.0-----					
+54.0----					
+42.3---					
+33.1--					
+25.9--					
+20.3--					
+15.9--					
+12.4--					
+9.72--					
+7.61--					
+5.96--					
+4.66--					
+3.65--					
+2.86--					
+2.24--					
+1.75--					
+1.37--					
+1.07--					
+0.839--					
+0.657-----					
+0.514-----					
+0.402-----					
+0.315-----					
+0.247-----					
+0.193-----					
+0.151-----					
+0.118-----					
+0.0926-----					
+0.0725-----					
+0.0567-----					
+0.0444-----					
+0.0347-----					
+0.0272-----					
+0.0213-----					
+0.0167-----					
+0.0130-----					
+0.0102-----					
+0.00799-----					
+0.00626-----					
+0.00490-----					
+0.00383-----					
+0.00300--					

ONTARIO RESEARCH FPL
6000 (50) 7
PNTR NUMBER +45

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.104368E+002

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--*					
+235--*					
+184--*					
+144--*					
+113--*					
+88.1--*					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--*					
+0.657--*					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--*					
+0.193--**					
+0.151--**					
+0.118--**					
+0.0926--**					
+0.0725-----*					
+0.0567-----*					
+0.0444-----*					
+0.0347-----*					
+0.0272-----*					
+0.0213-----*					
+0.0167-----*					
+0.0130-----*					
+0.0102-----*					
+0.00799-----*					
+0.00626-----*					
+0.00490-----*					
+0.00383-----*					
+0.00300--*					

ONTARIO RESEARCH FPL

LP 8:19:8 8/13/85

G000 (50) 28 DAYS
PNTR NUMBER +45

HP 10:28:36 8/13/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.5600 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+72.6600 G	INITIAL PRESSURE =	+0.9377 PSIA
PNTR+SAMPLE WEIGHT =	+73.2200 G	PORE DIAMETER =	+192.8700 MICRO-M
PNTR+SAMPLE+MERCURY =	+162.7400 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.9712 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.2674 CC/G
TOTAL PORE AREA =	+114.9550 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.0133 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0050 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0093 MICROMETERS
BULK DENSITY =	+1.5708 G/CC
APPARENT (SKELETAL) DENSITY =	+2.7085 G/CC

% CAPILLARY = +38.9963

% Pores by = 42.0%

ONTARIO RESEARCH FPL
 6000 (50) 28 DAYS
 PNTR NUMBER +45

LP 8:19:8 8/13/85
 HP 10:28:36 8/13/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+192.8700	+0.0000	+0.0000	+192.8700	+0.0000
+2.1	+88.1690	+0.0014	+0.0000	+140.5190	+0.0014
+3.0	+61.1072	+0.0014	+0.0000	+74.6381	+0.0000
+4.0	+45.1322	+0.0019	+0.0001	+53.1197	+0.0005
+4.9	+36.6825	+0.0024	+0.0001	+40.9073	+0.0005
+6.0	+30.1801	+0.0024	+0.0001	+33.4313	+0.0000
+6.9	+26.1518	+0.0024	+0.0001	+28.1659	+0.0000
+8.0	+22.6489	+0.0024	+0.0001	+24.4004	+0.0000
+9.0	+20.1365	+0.0024	+0.0001	+21.3927	+0.0000
+10.0	+18.0992	+0.0028	+0.0002	+19.1178	+0.0005
+12.0	+15.0716	+0.0033	+0.0003	+16.5854	+0.0005
+13.9	+12.9660	+0.0038	+0.0005	+14.0188	+0.0005
+15.9	+11.3609	+0.0038	+0.0005	+12.1635	+0.0000
+18.0	+10.0641	+0.0038	+0.0005	+10.7125	+0.0000
+20.0	+9.0529	+0.0043	+0.0007	+9.5585	+0.0005
+28.7	+6.3020	+0.0043	+0.0007	+7.6775	+0.0000
+38.8	+4.6603	+0.0043	+0.0007	+5.4812	+0.0000
+49.4	+3.6643	+0.0043	+0.0007	+4.1623	+0.0000
+59.8	+3.0227	+0.0043	+0.0007	+3.3435	+0.0000
+80.0	+2.2613	+0.0043	+0.0007	+2.6420	+0.0000
+99.0	+1.8278	+0.0046	+0.0014	+2.0445	+0.0004
+125.7	+1.4390	+0.0051	+0.0026	+1.6334	+0.0005
+149.0	+1.2140	+0.0056	+0.0041	+1.3265	+0.0005
+173.5	+1.0423	+0.0057	+0.0043	+1.1281	+0.0000
+199.0	+0.9088	+0.0057	+0.0044	+0.9755	+0.0000
+239.0	+0.7568	+0.0062	+0.0069	+0.8328	+0.0005
+279.0	+0.6483	+0.0072	+0.0125	+0.7025	+0.0010
+319.0	+0.5669	+0.0073	+0.0128	+0.6076	+0.0000
+363.0	+0.4983	+0.0073	+0.0132	+0.5326	+0.0001
+403.0	+0.4487	+0.0078	+0.0176	+0.4735	+0.0005
+452.8	+0.3994	+0.0079	+0.0181	+0.4241	+0.0001
+501.7	+0.3605	+0.0084	+0.0236	+0.3799	+0.0005
+602.3	+0.3003	+0.0090	+0.0305	+0.3304	+0.0006
+701.9	+0.2577	+0.0095	+0.0387	+0.2790	+0.0006
+800.6	+0.2259	+0.0096	+0.0402	+0.2418	+0.0001
+999.8	+0.1809	+0.0103	+0.0528	+0.2034	+0.0006
+1253.8	+0.1442	+0.0109	+0.0691	+0.1626	+0.0007
+1499.0	+0.1207	+0.0116	+0.0883	+0.1325	+0.0006
+1746.1	+0.1036	+0.0117	+0.0936	+0.1121	+0.0001
+1998.1	+0.0905	+0.0128	+0.1380	+0.0970	+0.0011
+2491.0	+0.0726	+0.0177	+0.3800	+0.0816	+0.0049
+2985.7	+0.0606	+0.0320	+1.2395	+0.0666	+0.0143
+3968.1	+0.0456	+0.0643	+3.6732	+0.0531	+0.0323
+4996.2	+0.0362	+0.0777	+4.9848	+0.0409	+0.0134
+7454.9	+0.0243	+0.0983	+7.7099	+0.0302	+0.0206
+9958.4	+0.0182	+0.1131	+10.5022	+0.0212	+0.0148
+12446.9	+0.0145	+0.1269	+13.8759	+0.0163	+0.0138
+14935.5	+0.0121	+0.1397	+17.7201	+0.0133	+0.0128

ONTARIO RESEARCH FPL
6000 (50) 28 DAYS
PNTR NUMBER +45

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20031.8	+0.0090	+0.1634	+26.6692	+0.0106	+0.0236
+25009.0	+0.0072	+0.1823	+35.9587	+0.0081	+0.0189
+29867.0	+0.0061	+0.1955	+43.9087	+0.0066	+0.0132
+40015.1	+0.0045	+0.2218	+63.8505	+0.0053	+0.0264
+49895.1	+0.0036	+0.2387	+80.4664	+0.0041	+0.0169
+59819.7	+0.0030	+0.2674	+114.9550	+0.0033	+0.0287
+49894.9	+0.0036	+0.2674	+114.9550	+0.0033	+0.0000
+40148.9	+0.0045	+0.2661	+113.6280	+0.0041	-0.0013
+30060.3	+0.0060	+0.2628	+111.1160	+0.0053	-0.0033
+25083.0	+0.0072	+0.2590	+108.8210	+0.0066	-0.0038
+20076.0	+0.0090	+0.2547	+106.7030	+0.0081	-0.0043
+15054.0	+0.0120	+0.2475	+103.9720	+0.0105	-0.0072
+12565.4	+0.0144	+0.2427	+102.5180	+0.0132	-0.0046
+10047.0	+0.0180	+0.2369	+101.0890	+0.0162	-0.0058
+7528.6	+0.0240	+0.2282	+99.4352	+0.0210	-0.0087
+5010.2	+0.0361	+0.2123	+97.3201	+0.0301	-0.0159
+3513.0	+0.0515	+0.1903	+95.3100	+0.0438	-0.0220
+2511.1	+0.0720	+0.1749	+94.3117	+0.0618	-0.0154
+1004.9	+0.1800	+0.1359	+93.0740	+0.1260	-0.0390
+751.0	+0.2408	+0.1230	+92.8283	+0.2104	-0.0129
+501.0	+0.3610	+0.1105	+92.6624	+0.3009	-0.0125
+399.4	+0.4528	+0.1066	+92.6243	+0.4069	-0.0039
+300.8	+0.6013	+0.1046	+92.6092	+0.5270	-0.0020
+249.0	+0.7262	+0.1036	+92.6031	+0.6637	-0.0010
+197.3	+0.9168	+0.1031	+92.6005	+0.8215	-0.0005
+150.2	+1.2043	+0.1016	+92.5950	+1.0606	-0.0015
+100.5	+1.7994	+0.1011	+92.5935	+1.5019	-0.0005
+73.3	+2.4663	+0.1006	+92.5926	+2.1329	-0.0005
+59.8	+3.0253	+0.1001	+92.5919	+2.7458	-0.0005
+47.7	+3.7920	+0.1001	+92.5918	+3.4086	-0.0000
+22.0	+8.2244	+0.0986	+92.5908	+6.0082	-0.0014

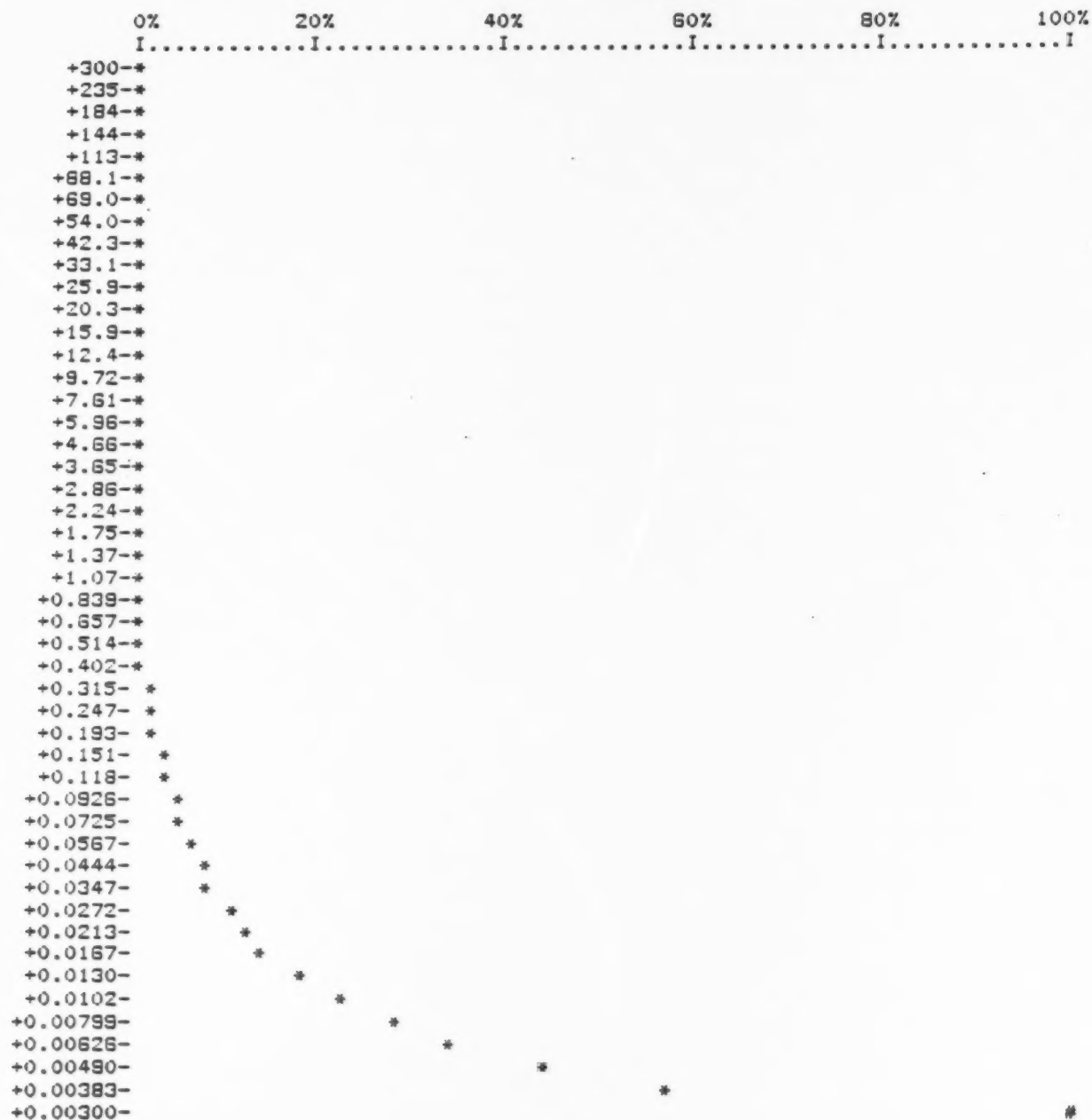
LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

	0%	20%	40%	60%	80%	100%
+300-*	+					
+235-*	+					
+184-*		+				
+144-*		+				
+113-*		+				
+88.1-*		+				
+69.0-*		+				
+54.0-*		+				
+42.3-*		+				
+33.1-*		+				
+25.9-*		+				
+20.3-*		+				
+15.9-*		+				
+12.4-*		+				
+9.72-*		+				
+7.61-*		+				
+5.96-*			+			
+4.66-*			+			
+3.65-*			+			
+2.86-*				+		
+2.24-*				+		
+1.75-*				+		
+1.37-*				+		
+1.07-*				+		
+0.839-*				+		
+0.657-*				+		
+0.514-*				+		
+0.402-*				+		
+0.315-*				+		
+0.247-*				+		
+0.193-*				+		
+0.151-*				+		
+0.118-*				+		
+0.0926-*				+		
+0.0725-*				+		
+0.0567-*				+		
+0.0444-*				+		
+0.0347-*				+		
+0.0272-*				+		
+0.0213-*				+		
+0.0167-*				+		
+0.0130-*				+		
+0.0102-*				+		
+0.00799-*				+		
+0.00626-*				+		
+0.00490-*				+		
+0.00383-*				+		
+0.00300-*				+		

ONTARIO RESEARCH FPL
4000 (30) 1
PNTR NUMBER +66

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +52.5128



ONTARIO RESEARCH FPL
4000 (50) 1
PNTR NUMBER +66

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.369088E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300-*					
+235-*					
+184-*					
+144-*					
+113-****					
+88.1-*****					
+69.0-***					
+54.0-*					
+42.3-*					
+33.1-*					
+25.9-*					
+20.3-*					
+15.9-*					
+12.4-*					
+9.72-*					
+7.61-*					
+5.96-*					
+4.66-*					
+3.65-*					
+2.86-***					
+2.24-*****					
+1.75-*****					
+1.37-*****					
+1.07-*****					
+0.839-*****					
+0.657-*****					
+0.514-*****					
+0.402-*****					
+0.315-*****					
+0.247-*****					
+0.193-*****					
+0.151-*****					
+0.118-*****					
+0.0926-*****					
+0.0725-*****					
+0.0567-*****					
+0.0444-*****					
+0.0347-*****					
+0.0272-*****					
+0.0213-*****					
+0.0167-*****					
+0.0130-*****					
+0.0102-*****					
+0.00799-*****					
+0.00626-*****					
+0.00490-*****					
+0.00383-*****					
+0.00300-*					

ONTARIO RESEARCH FPL
4000 (50) 1
PNTR NUMBER +66

LP 15:51:29 7/16/85
HP 16:22:48 7/16/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.670796E+001

0%	20%	40%	60%	80%	100%
I.....I.....I.....I.....I.....I					
+300--*					
+235--*					
+184--*					
+144--*					
+113--*					
+88.1--*					
+69.0--*					
+54.0--*					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--**					
+0.657--**					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--*					
+0.193--**					
+0.151--***					
+0.118--***					
+0.0926--**					
+0.0725--****					
+0.0567--****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*****					
+0.0130--*****					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
4000 (50) 3
PNTR NUMBER +40

LP 8:12:13 7/19/85
HP 8:41:13 7/19/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.8600 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+71.1900 G	INITIAL PRESSURE =	+0.8864 PSIA
PNTR+SAMPLE WEIGHT =	+72.0500 G	PORE DIAMETER =	+204.0270 MICRO-M
PNTR+SAMPLE+MERCURY =	+155.3700 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.8059 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.3477 CC/G
TOTAL PORE AREA =	+45.5088 SG-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.2750 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0058 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0306 MICROMETERS
BULK DENSITY =	+1.3245 G/CC
APPARENT (SKELETAL) DENSITY =	+2.4549 G/CC

% CAPILLARY = +77.8634

ONTARIO RESEARCH FPL
4000 (50) 3
PNTR NUMBER +40

LP 8:12:13 7/19/85
HP 8:41:3 7/19/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+195.9310	+0.0000	+0.0000	+199.9790	+0.0000
+1.9	+93.8681	+0.0028	+0.0001	+144.8990	+0.0028
+2.9	+62.0284	+0.0037	+0.0001	+77.9482	+0.0009
+3.9	+46.1445	+0.0046	+0.0002	+54.0864	+0.0009
+4.9	+36.8467	+0.0049	+0.0002	+41.4956	+0.0003
+6.0	+30.2170	+0.0052	+0.0003	+33.5319	+0.0003
+7.0	+25.9321	+0.0055	+0.0003	+28.0745	+0.0003
+8.0	+22.7114	+0.0058	+0.0004	+24.3217	+0.0003
+9.0	+20.2024	+0.0064	+0.0005	+21.4569	+0.0006
+10.0	+18.1658	+0.0064	+0.0005	+19.1841	+0.0000
+11.9	+15.1549	+0.0068	+0.0005	+16.6603	+0.0003
+13.9	+12.9797	+0.0071	+0.0006	+14.0673	+0.0003
+15.9	+11.3609	+0.0077	+0.0008	+12.1703	+0.0006
+18.0	+10.0723	+0.0083	+0.0011	+10.7166	+0.0006
+19.9	+9.0662	+0.0083	+0.0011	+9.5693	+0.0000
+28.8	+6.2825	+0.0083	+0.0011	+7.6744	+0.0000
+39.0	+4.6322	+0.0083	+0.0011	+5.4574	+0.0000
+49.4	+3.6635	+0.0089	+0.0017	+4.1479	+0.0006
+59.2	+3.0560	+0.0092	+0.0020	+3.3598	+0.0003
+78.9	+2.2928	+0.0099	+0.0030	+2.6744	+0.0006
+99.6	+1.8157	+0.0105	+0.0042	+2.0543	+0.0006
+125.5	+1.4407	+0.0111	+0.0058	+1.6282	+0.0006
+151.5	+1.1935	+0.0121	+0.0086	+1.3171	+0.0009
+174.8	+1.0346	+0.0133	+0.0131	+1.1140	+0.0012
+199.1	+0.9085	+0.0314	+0.0876	+0.9715	+0.0181
+240.7	+0.7514	+0.0642	+0.2458	+0.8300	+0.0328
+279.8	+0.6463	+0.1124	+0.5213	+0.6989	+0.0481
+317.8	+0.5691	+0.1262	+0.6122	+0.6077	+0.0108
+359.7	+0.5028	+0.1363	+0.6879	+0.5360	+0.0101
+402.6	+0.4492	+0.1443	+0.7551	+0.4760	+0.0080
+452.3	+0.3998	+0.1523	+0.8305	+0.4245	+0.0080
+499.1	+0.3623	+0.1585	+0.8952	+0.3811	+0.0062
+601.6	+0.3006	+0.1690	+1.0217	+0.3315	+0.0105
+700.2	+0.2583	+0.1770	+1.1366	+0.2795	+0.0080
+796.8	+0.2270	+0.1832	+1.2386	+0.2426	+0.0062
+994.0	+0.1819	+0.1940	+1.4505	+0.2045	+0.0108
+1244.0	+0.1454	+0.2040	+1.6931	+0.1637	+0.0099
+1500.8	+0.1205	+0.2123	+1.9454	+0.1329	+0.0084
+1744.9	+0.1036	+0.2186	+2.1675	+0.1121	+0.0062
+1994.9	+0.0907	+0.2242	+2.3982	+0.0972	+0.0056
+2486.4	+0.0727	+0.2344	+2.9006	+0.0817	+0.0103
+2987.5	+0.0605	+0.2419	+3.3495	+0.0666	+0.0075
+3980.8	+0.0454	+0.2556	+4.3820	+0.0530	+0.0137
+5008.9	+0.0361	+0.2649	+5.2986	+0.0408	+0.0093
+7467.6	+0.0242	+0.2811	+7.4426	+0.0302	+0.0162
+9971.1	+0.0181	+0.2907	+9.2635	+0.0212	+0.0096
+12459.6	+0.0145	+0.2979	+11.0124	+0.0163	+0.0071
+14948.2	+0.0121	+0.3038	+12.7812	+0.0133	+0.0059

ONTARIO RESEARCH FPL
4000 (50) 3
PNTR NUMBER +40

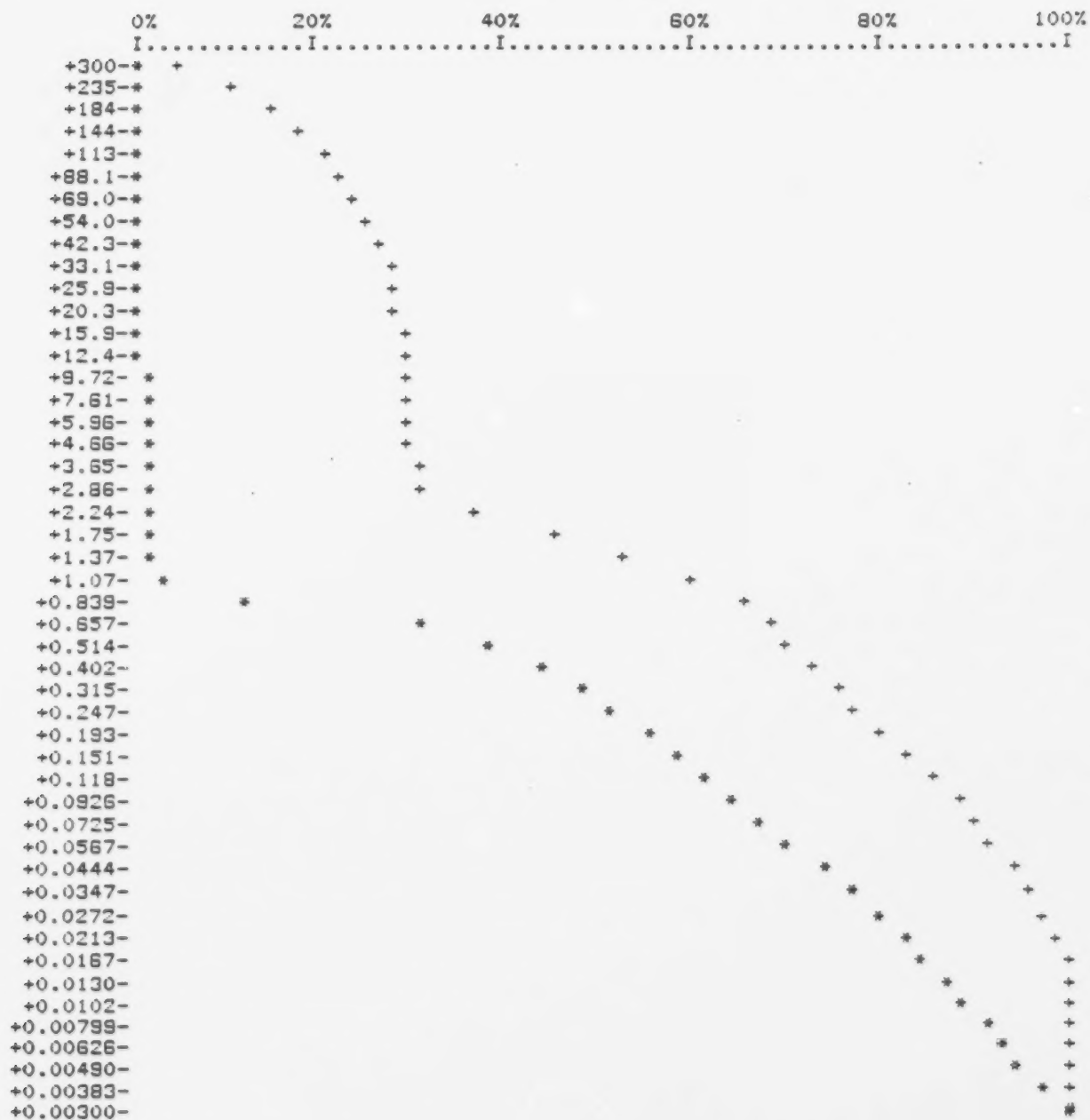
LP 8:12:13 7/19/85
HP 8:41:3 7/19/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20059.5	+0.0090	+0.3124	+16.0610	+0.0106	+0.0087
+24932.5	+0.0073	+0.3180	+18.7916	+0.0081	+0.0056
+29879.9	+0.0061	+0.3229	+21.7507	+0.0067	+0.0049
+40057.9	+0.0045	+0.3327	+29.1785	+0.0053	+0.0098
+49937.9	+0.0036	+0.3403	+36.6949	+0.0041	+0.0076
+59713.6	+0.0030	+0.3477	+45.5088	+0.0033	+0.0073
+49937.8	+0.0036	+0.3477	+45.5088	+0.0033	+0.0000
+40147.2	+0.0045	+0.3477	+45.5088	+0.0041	+0.0000
+30013.7	+0.0060	+0.3477	+45.5088	+0.0053	+0.0000
+25125.8	+0.0072	+0.3477	+45.5088	+0.0066	+0.0000
+20089.0	+0.0090	+0.3477	+45.5088	+0.0081	+0.0000
+15067.0	+0.0120	+0.3477	+45.5088	+0.0105	+0.0000
+12548.6	+0.0144	+0.3472	+45.3667	+0.0132	-0.0005
+10045.0	+0.0180	+0.3440	+44.5880	+0.0162	-0.0032
+7526.6	+0.0240	+0.3396	+43.7446	+0.0210	-0.0044
+5008.3	+0.0361	+0.3314	+42.6531	+0.0301	-0.0082
+3513.5	+0.0515	+0.3214	+41.7361	+0.0438	-0.0100
+2507.7	+0.0721	+0.3119	+41.1261	+0.0618	-0.0094
+999.0	+0.1810	+0.2807	+40.1398	+0.1266	-0.0312
+746.1	+0.2424	+0.2699	+39.9346	+0.2117	-0.0109
+498.2	+0.3631	+0.2559	+39.7503	+0.3027	-0.0139
+396.6	+0.4560	+0.2485	+39.6777	+0.4095	-0.0074
+295.2	+0.6128	+0.2386	+39.6038	+0.5344	-0.0099
+245.4	+0.7370	+0.2325	+39.5672	+0.6749	-0.0062
+195.7	+0.9243	+0.2248	+39.5301	+0.8307	-0.0077
+148.8	+1.2153	+0.1919	+39.4074	+1.0698	-0.0328
+97.7	+1.8504	+0.1505	+39.2994	+1.5328	-0.0414
+73.0	+2.4768	+0.1177	+39.2387	+2.1636	-0.0328
+59.3	+3.0476	+0.1082	+39.2249	+2.7622	-0.0095
+47.3	+3.8259	+0.1067	+39.2231	+3.4368	-0.0015
+22.5	+8.0254	+0.1042	+39.2215	+5.9257	-0.0025

ONTARIO RESEARCH FPL
4000 (50) 3
PNTR NUMBER +40

LP 8:12:13 7/19/85
HP 8:41:3 7/19/85

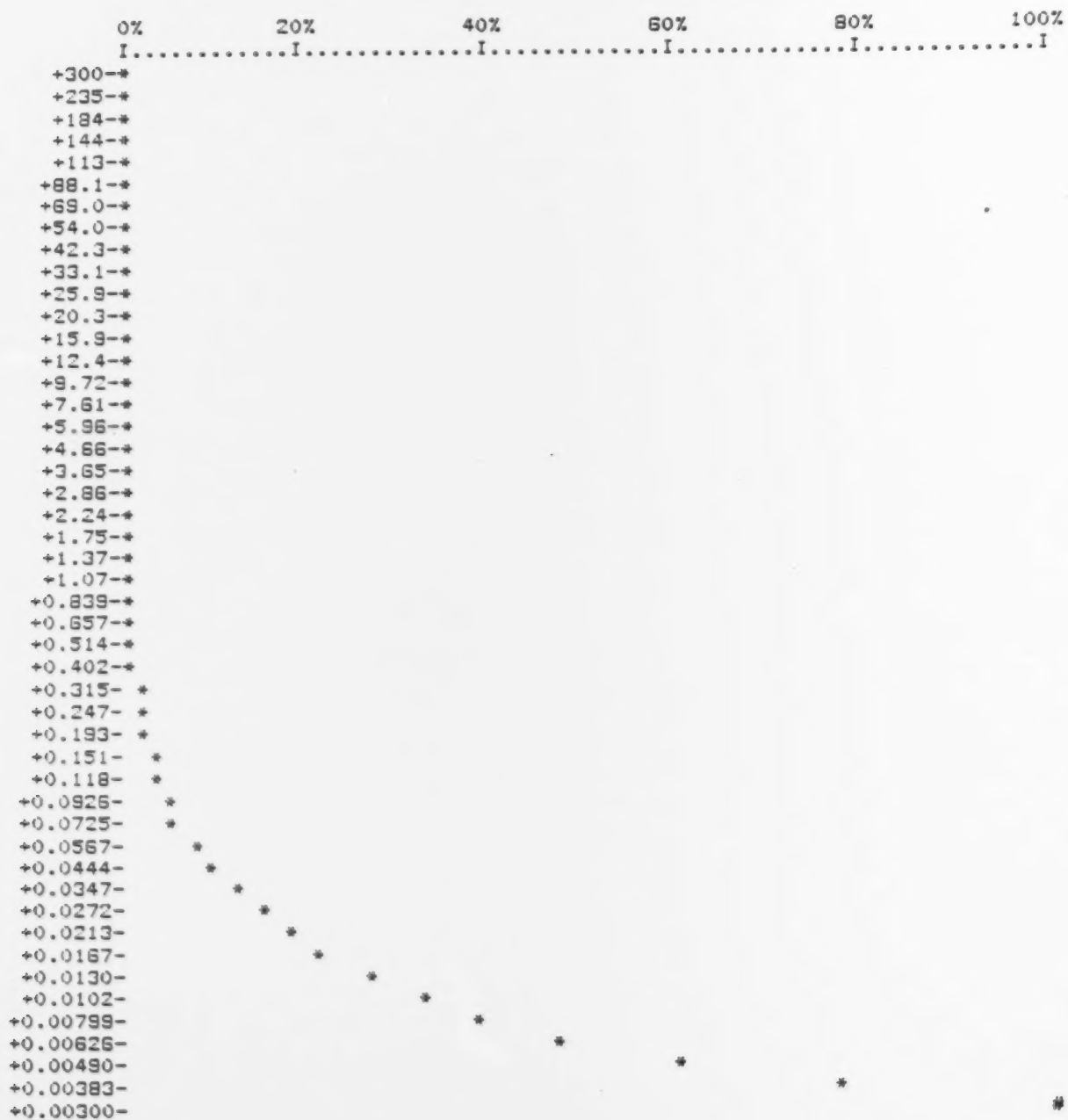
CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.3477



ONTARIO RESEARCH FPL
4000 (50) 3
PNTR NUMBER +40

LP 8:12:13 7/19/85
HP 8:41:3 7/19/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +45.5088



ONTARIO RESEARCH FPL
4000 (50) 3
PNTR NUMBER +40

LP 8:12:13 7/19/85
HP 8:41:3 7/19/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.465824E-001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--					
+235--					
+184--					
+144---					
+113----					
+88.1-----					
+69.0---					
+54.0--					
+42.3--					
+33.1--					
+25.9--					
+20.3--					
+15.9--					
+12.4--					
+9.72--					
+7.61--					
+5.96--					
+4.66--					
+3.65--					
+2.86--					
+2.24--					
+1.75--					
+1.37--					
+1.07--					
+0.839-----					
+0.657-----					
+0.514-----					
+0.402-----					
+0.315-----					
+0.247-----					
+0.193-----					
+0.151-----					
+0.118-----					
+0.0926-----					
+0.0725-----					
+0.0567-----					
+0.0444-----					
+0.0347-----					
+0.0272-----					
+0.0213-----					
+0.0167-----					
+0.0130-----					
+0.0102-----					
+0.00799-----					
+0.00626-----					
+0.00490-----					
+0.00383-----					
+0.00300--					

ONTARIO RESEARCH FPL
4000 (50) 3
PNTR NUMBER +40

LP 8:12:13 7/19/85
HP 8:41:3 7/19/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.749546E+001

	0%	20%	40%	60%	80%	100%
	I.....	I.....	I.....	I.....	I.....	I.....
+300--						
+235--						
+184--						
+144--						
+113--						
+88.1--						
+69.0--						
+54.0--						
+42.3--						
+33.1--						
+25.9--						
+20.3--						
+15.9--						
+12.4--						
+9.72--						
+7.61--						
+5.96--						
+4.66--						
+3.63--						
+2.86--						
+2.24--						
+1.75--						
+1.37--						
+1.07--						
+0.839--						
+0.657--**						
+0.514--						
+0.402--						
+0.315--						
+0.247--						
+0.193--**						
+0.151--**						
+0.118--**						
+0.0926--**						
+0.0725-----						
+0.0567-----						
+0.0444-----						
+0.0347-----						
+0.0272-----						
+0.0213-----						
+0.0167-----						
+0.0130-----						
+0.0102-----						
+0.00799-----						
+0.00626-----						
+0.00490-----						
+0.00383-----						
+0.00300--*						

ONTARIO RESEARCH FPL
4000 (50) 7
PNTR NUMBER +40

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.9000 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+71.4600 G	INITIAL PRESSURE =	+0.9451 PSIA
PNTR+SAMPLE WEIGHT =	+72.3600 G	PORE DIAMETER =	+191.3750 MICRO-M
PNTR+SAMPLE+MERCURY =	+155.9600 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.8059 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.3120 CC/G
TOTAL PORE AREA =	+72.6716 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.0702 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0044 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0172 MICROMETERS
BULK DENSITY =	+1.4317 G/CC
APPARENT (SKELETAL) DENSITY =	+2.5875 G/CC

% CAPILLARY = +73.1285

Porosity = 44.7%

ONTARIO RESEARCH FPL
4000 (50) 7
PNTR NUMBER +40

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+191.3750	+0.0000	+0.0000	+191.3740	+0.0000
+2.0	+89.4468	+0.0021	+0.0001	+140.4110	+0.0021
+3.0	+60.0865	+0.0026	+0.0001	+74.7566	+0.0006
+4.0	+45.0499	+0.0035	+0.0002	+52.5581	+0.0009
+4.9	+36.6825	+0.0038	+0.0002	+40.8661	+0.0003
+6.0	+30.1432	+0.0038	+0.0002	+33.4128	+0.0000
+7.0	+25.8506	+0.0041	+0.0002	+27.9969	+0.0003
+8.0	+22.6697	+0.0044	+0.0003	+24.2601	+0.0003
+9.0	+20.1529	+0.0044	+0.0003	+21.4113	+0.0000
+10.0	+18.1391	+0.0047	+0.0003	+19.1460	+0.0003
+12.0	+15.0993	+0.0047	+0.0003	+16.6192	+0.0000
+13.9	+12.9728	+0.0050	+0.0004	+14.0360	+0.0003
+15.9	+11.3609	+0.0053	+0.0005	+12.1669	+0.0003
+18.0	+10.0641	+0.0053	+0.0005	+10.7125	+0.0000
+20.0	+9.0596	+0.0056	+0.0006	+9.5618	+0.0003
+29.7	+6.3092	+0.0056	+0.0006	+7.6844	+0.0000
+38.7	+4.6731	+0.0056	+0.0007	+5.4911	+0.0000
+48.7	+3.7108	+0.0056	+0.0007	+4.1919	+0.0000
+59.7	+3.0282	+0.0059	+0.0010	+3.3695	+0.0003
+80.5	+2.2460	+0.0065	+0.0019	+2.6371	+0.0006
+99.1	+1.8258	+0.0068	+0.0025	+2.0359	+0.0003
+125.4	+1.4419	+0.0068	+0.0026	+1.6339	+0.0000
+148.7	+1.2161	+0.0074	+0.0044	+1.3290	+0.0006
+173.7	+1.0412	+0.0075	+0.0045	+1.1287	+0.0000
+198.9	+0.9093	+0.0084	+0.0082	+0.9753	+0.0009
+238.5	+0.7582	+0.0099	+0.0153	+0.8338	+0.0015
+280.8	+0.6440	+0.0131	+0.0339	+0.7011	+0.0033
+319.8	+0.5655	+0.0196	+0.0767	+0.6047	+0.0065
+360.7	+0.5014	+0.0351	+0.1933	+0.5334	+0.0155
+402.6	+0.4493	+0.0477	+0.2995	+0.4753	+0.0126
+448.4	+0.4034	+0.0601	+0.4151	+0.4263	+0.0123
+498.1	+0.3631	+0.0704	+0.5224	+0.3833	+0.0103
+598.5	+0.3022	+0.0827	+0.6711	+0.3326	+0.0124
+696.1	+0.2598	+0.0907	+0.7844	+0.2810	+0.0080
+796.7	+0.2270	+0.0972	+0.8912	+0.2434	+0.0065
+996.8	+0.1814	+0.1078	+1.0997	+0.2042	+0.0106
+1251.6	+0.1445	+0.1185	+1.3614	+0.1630	+0.0107
+1493.8	+0.1211	+0.1268	+1.6114	+0.1328	+0.0083
+1743.8	+0.1037	+0.1339	+1.8648	+0.1124	+0.0071
+1992.8	+0.0908	+0.1407	+2.1452	+0.0972	+0.0068
+2488.5	+0.0727	+0.1540	+2.7972	+0.0817	+0.0133
+2983.2	+0.0606	+0.1638	+3.3841	+0.0667	+0.0098
+3981.5	+0.0454	+0.1813	+4.7014	+0.0530	+0.0175
+4979.8	+0.0363	+0.1928	+5.8326	+0.0409	+0.0116
+7468.2	+0.0242	+0.2133	+8.5324	+0.0303	+0.0204
+9956.7	+0.0182	+0.2275	+11.2107	+0.0212	+0.0142
+12445.2	+0.0145	+0.2379	+13.7395	+0.0163	+0.0103
+14948.7	+0.0121	+0.2452	+15.9564	+0.0133	+0.0074

ONTARIO RESEARCH FPL
4000 (50) 7
PNTR NUMBER +40

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SQ-M/G	MEAN DIAMETER MICRO-M	DV
+20030.2	+0.0090	+0.2552	+19.7535	+0.0106	+0.0100
+24992.5	+0.0072	+0.2623	+23.2277	+0.0081	+0.0071
+29969.7	+0.0060	+0.2684	+26.9452	+0.0066	+0.0062
+39983.8	+0.0045	+0.2784	+34.4931	+0.0053	+0.0100
+49848.9	+0.0036	+0.2889	+44.8232	+0.0041	+0.0105
+60116.2	+0.0030	+0.3120	+72.6716	+0.0033	+0.0231
+49878.4	+0.0036	+0.3120	+72.6716	+0.0033	+0.0000
+40117.6	+0.0045	+0.3109	+71.5596	+0.0041	-0.0011
+30088.5	+0.0060	+0.3085	+69.7732	+0.0053	-0.0023
+25051.7	+0.0072	+0.3062	+68.3456	+0.0066	-0.0024
+20059.5	+0.0090	+0.3026	+66.5959	+0.0081	-0.0036
+15067.3	+0.0120	+0.2985	+65.0085	+0.0105	-0.0042
+12534.0	+0.0144	+0.2943	+63.7498	+0.0132	-0.0042
+10060.3	+0.0180	+0.2904	+62.7889	+0.0162	-0.0039
+7542.0	+0.0240	+0.2841	+61.5908	+0.0210	-0.0063
+5008.7	+0.0361	+0.2731	+60.1180	+0.0300	-0.0111
+3512.5	+0.0515	+0.2591	+58.8408	+0.0438	-0.0140
+2508.6	+0.0721	+0.2463	+58.0115	+0.0618	-0.0128
+1003.6	+0.1802	+0.2065	+56.7503	+0.1262	-0.0398
+747.8	+0.2419	+0.1941	+56.5147	+0.2110	-0.0124
+498.9	+0.3625	+0.1778	+56.2995	+0.3022	-0.0163
+396.4	+0.4563	+0.1692	+56.2159	+0.4094	-0.0086
+298.8	+0.6052	+0.1589	+56.1381	+0.5307	-0.0103
+247.1	+0.7319	+0.1524	+56.0994	+0.6685	-0.0065
+197.4	+0.9163	+0.1451	+56.0636	+0.8241	-0.0074
+149.2	+1.2118	+0.1231	+55.9809	+1.0641	-0.0220
+99.9	+1.8097	+0.1093	+55.9444	+1.5107	-0.0138
+73.0	+2.4773	+0.1069	+55.9400	+2.1435	-0.0024
+58.7	+3.0837	+0.1066	+55.9395	+2.7805	-0.0003
+47.7	+3.7941	+0.1060	+55.9388	+3.4389	-0.0006
+21.7	+8.3458	+0.1051	+55.9383	+6.0700	-0.0009

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

0% 20% 40% 60% 80% 100%

I I I I I I

+300-*

+235-*

+184-*

+144-*

+113-*

+88.1-*

+69.0-*

+54.0-*

+42.3-*

+33.1-*

+25.9-*

+20.3-*

+15.9-*

+12.4-*

+9.72-*

+7.61-*

+5.86-*

+4.66-*

+3.65-*

+2.86-*

+2.24-*

+1.75- *

+1.37- *

+1.07- *

+0.839- *

+0.657- *

+0.514- *

+0.402- *

+0.315- *

+0.247- *

+0.193- *

+0.151- *

+0.118- *

+0.0926- *

+0.0725- *

+0.0567- *

+0.0444- *

+0.0347- *

+0.0272- *

+0.0213- *

+0.0167- *

+0.0130- *

+0.0102- *

+0.00799- *

+0.00626- *

+0.00490- *

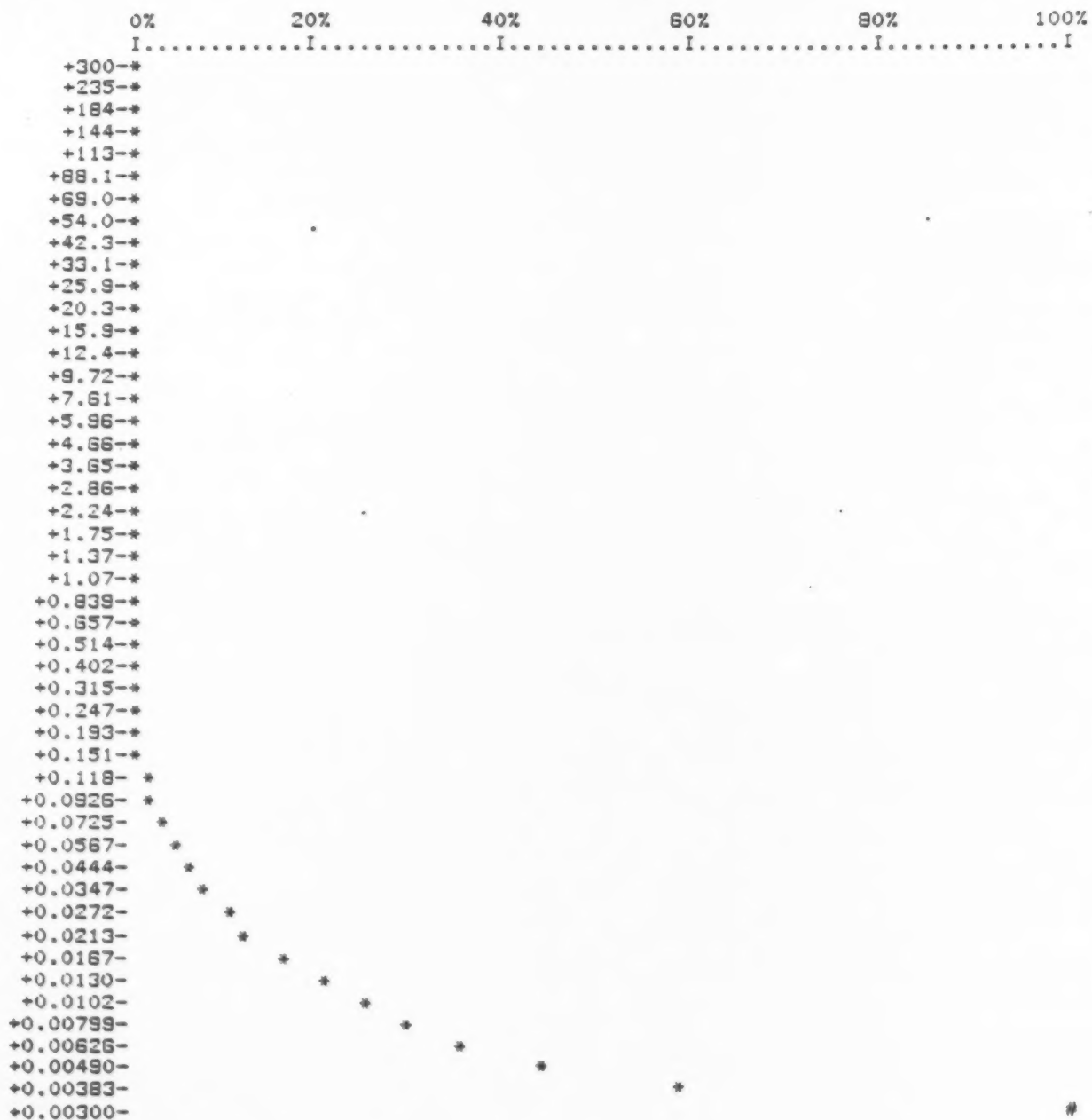
+0.00383- *

+0.00300- *

ONTARIO RESEARCH FPL
4000 (50) 7
PNTR NUMBER +40

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +72.6716



LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

Percentage of Respondents	Percentage of Respondents who believe that the use of force is justified
0%	0%
20%	10%
40%	20%
60%	30%
80%	40%
100%	50%

```
+300-*
+235-*
+184-*
+144-****
+113-*****
+88.1-*****
+69.0-****
+54.0-***
+42.3-***
+33.1-*
+25.9-*
+20.3-*
+15.9-*
+12.4-*
+9.72-*
+7.61-*
+5.96-*
+4.66-*
+3.65-*
+2.86-*
+2.24-**
+1.75-*
+1.37-*
+1.07-*
+0.839-*****
+0.657-*****
+0.514-*****
+0.402-*****
+0.315-*****
+0.247-*****
+0.193-*****
+0.151-*****
+0.118-*****
+0.0926-*****
+0.0725-*****
+0.0567-*****
+0.0444-*****
+0.0347-*****
+0.0272-*****
+0.0213-*****
+0.0167-*****
+0.0130-*****
+0.0102-*****
+0.00799-*****
+0.00626-*****
+0.00490-*****
+0.00383-*****
+0.00300-*
```


ONTARIO RESEARCH FPL
4000 (50) 7
PNTR NUMBER +40

LP 11:47:19 7/22/85
HP 12:10:47 7/22/85

INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.969515E+001

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--					
+235--					
+184--					
+144--					
+113--					
+88.1--					
+69.0--					
+54.0--					
+42.3--					
+33.1--					
+25.9--					
+20.3--					
+15.9--					
+12.4--					
+9.72--					
+7.61--					
+5.96--					
+4.66--					
+3.65--					
+2.86--					
+2.24--					
+1.75--					
+1.37--					
+1.07--					
+0.839--					
+0.657--					
+0.514--					
+0.402--					
+0.315--					
+0.247--					
+0.193--					
+0.151--**					
+0.118--**					
+0.0926--**					
+0.0725-----					
+0.0567-----					
+0.0444-----					
+0.0347-----					
+0.0272-----					
+0.0213-----					
+0.0167-----					
+0.0130-----					
+0.0102-----					
+0.00789-----					
+0.00626-----					
+0.00490-----					
+0.00383-----					
+0.00300--					

RE +
CMD>RE 40 4

MICROMERITICS AUTO-PORE 9200 V2.02

PAGE 1

ONTARIO RESEARCH FPL
4000 (50) 28 DAYS
PNTR NUMBER +40

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

LP EQUILIBRATION =	+10.0000 SEC	PNTR CONSTANT =	+10.7900 MICRO-L/PF
HP EQUILIBRATION =	+30.0000 SEC	THETA =	+130.0000
SAMPLE WEIGHT =	+0.6400 G	GAMMA =	+485.0000 DYNES/CM
PNTR WEIGHT =	+71.1000 G	INITIAL PRESSURE =	+0.9377 PSIA
PNTR+SAMPLE WEIGHT =	+71.7400 G	PORE DIAMETER =	+192.8700 MICRO-M
PNTR+SAMPLE+MERCURY =	+158.2700 G	MERCURY DENSITY =	+13.5335 G/CC
PNTR VOLUME =	+6.8059 CC		

INTRUSION (PRESSURIZATION) DATA SUMMARY

TOTAL INTRUSION VOLUME =	+0.2054 CC/G
TOTAL PORE AREA =	+72.3656 SQ-M/G
MEDIAN PORE DIAMETER (VOLUME) =	+0.0389 MICROMETERS
MEDIAN PORE DIAMETER (AREA) =	+0.0044 MICROMETERS
AVERAGE PORE DIAMETER (4V/A) =	+0.0114 MICROMETERS
BULK DENSITY =	+1.5529 G/CC
APPARENT (SKELETAL) DENSITY =	+2.2802 G/CC

% CAPILLARY = +34.2322

% Porosity - 31.9%

ONTARIO RESEARCH FPL
4000 (50) 28 DAYS
PNTR NUMBER +40

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SG-M/G	MEAN DIAMETER MICRO-M	DV
+0.9	+192.8700	+0.0000	+0.0000	+192.8700	+0.0000
+2.1	+88.1690	+0.0016	+0.0000	+140.5190	+0.0016
+3.0	+61.1072	+0.0029	+0.0001	+74.6381	+0.0012
+4.0	+45.1322	+0.0029	+0.0001	+53.1197	+0.0000
+4.9	+36.6825	+0.0029	+0.0001	+40.9073	+0.0000
+6.0	+30.1801	+0.0033	+0.0002	+33.4313	+0.0004
+6.9	+26.1518	+0.0037	+0.0002	+28.1659	+0.0004
+8.0	+22.6489	+0.0037	+0.0002	+24.4004	+0.0000
+9.0	+20.1365	+0.0041	+0.0003	+21.3927	+0.0004
+10.0	+18.0992	+0.0041	+0.0003	+19.1178	+0.0000
+12.0	+15.0716	+0.0041	+0.0003	+16.5854	+0.0000
+13.9	+12.9660	+0.0041	+0.0003	+14.0188	+0.0000
+15.9	+11.3609	+0.0041	+0.0003	+12.1635	+0.0000
+18.0	+10.0641	+0.0041	+0.0003	+10.7125	+0.0000
+20.0	+9.0529	+0.0046	+0.0005	+9.5585	+0.0004
+28.7	+6.3031	+0.0046	+0.0005	+7.6780	+0.0000
+38.8	+4.6609	+0.0046	+0.0005	+5.4820	+0.0000
+49.4	+3.6646	+0.0046	+0.0005	+4.1628	+0.0000
+59.8	+3.0229	+0.0046	+0.0005	+3.3438	+0.0000
+80.0	+2.2614	+0.0046	+0.0005	+2.6422	+0.0000
+98.9	+1.8279	+0.0047	+0.0008	+2.0446	+0.0001
+125.7	+1.4390	+0.0047	+0.0008	+1.6334	+0.0000
+149.0	+1.2140	+0.0052	+0.0022	+1.3265	+0.0004
+173.5	+1.0423	+0.0052	+0.0023	+1.1281	+0.0000
+199.0	+0.9088	+0.0052	+0.0024	+0.9755	+0.0000
+239.0	+0.7568	+0.0061	+0.0065	+0.8326	+0.0009
+279.0	+0.6483	+0.0061	+0.0068	+0.7025	+0.0000
+319.0	+0.5669	+0.0066	+0.0098	+0.6076	+0.0005
+363.0	+0.4983	+0.0070	+0.0132	+0.5326	+0.0005
+403.0	+0.4487	+0.0071	+0.0135	+0.4735	+0.0000
+452.8	+0.3994	+0.0075	+0.0179	+0.4241	+0.0005
+501.7	+0.3605	+0.0080	+0.0227	+0.3799	+0.0005
+602.3	+0.3003	+0.0085	+0.0288	+0.3304	+0.0005
+701.9	+0.2577	+0.0085	+0.0288	+0.2790	+0.0000
+800.6	+0.2259	+0.0087	+0.0315	+0.2418	+0.0002
+999.8	+0.1809	+0.0092	+0.0425	+0.2034	+0.0006
+1253.8	+0.1442	+0.0102	+0.0669	+0.1626	+0.0010
+1499.0	+0.1207	+0.0120	+0.1210	+0.1325	+0.0018
+1746.1	+0.1036	+0.0150	+0.2284	+0.1121	+0.0030
+1998.0	+0.0905	+0.0242	+0.6067	+0.0971	+0.0082
+2490.7	+0.0726	+0.0540	+2.0702	+0.0816	+0.0298
+2985.4	+0.0606	+0.0715	+3.1189	+0.0666	+0.0175
+3967.8	+0.0456	+0.0932	+4.7518	+0.0531	+0.0217
+4995.9	+0.0362	+0.1066	+6.0604	+0.0409	+0.0134
+7454.6	+0.0243	+0.1283	+8.9351	+0.0302	+0.0217
+9958.4	+0.0182	+0.1283	+8.9351	+0.0212	+0.0000
+12446.9	+0.0145	+0.1283	+8.9351	+0.0163	+0.0000
+14935.5	+0.0121	+0.1283	+8.9351	+0.0133	+0.0000

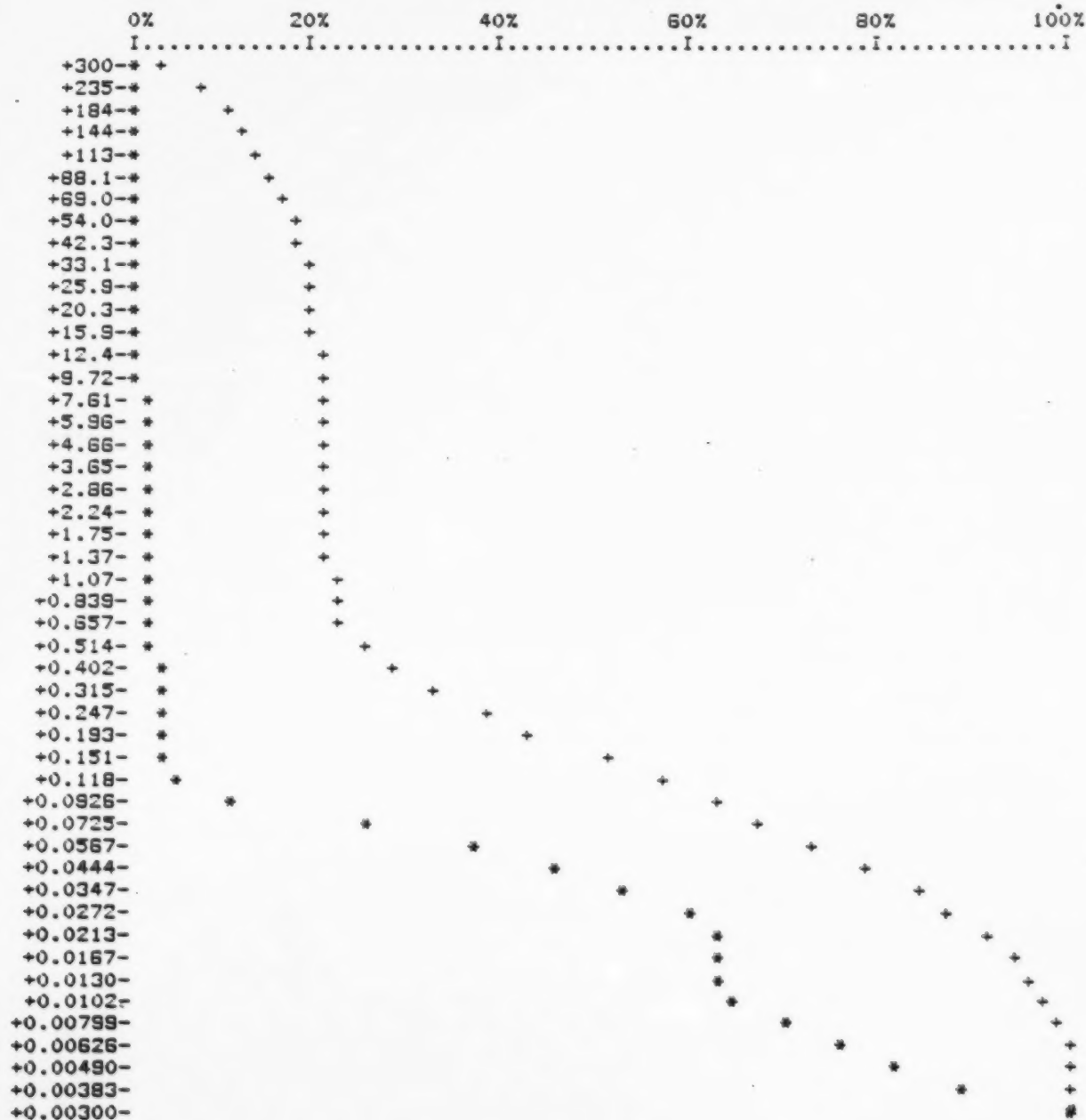
ONTARIO RESEARCH FPL
4000 (50) 28 DAYS
PNTR NUMBER +40

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

PRESSURE PSIA	PORE DIAMETER MICRO-M	INTRUSION VOLUME CC/G	PORE SURFACE SG-M/G	MEAN DIAMETER MICRO-M	DV
+20031.9	+0.0090	+0.1362	+11.9313	+0.0106	+0.0075
+25009.1	+0.0072	+0.1478	+17.6289	+0.0081	+0.0116
+29867.1	+0.0061	+0.1560	+22.6022	+0.0066	+0.0083
+40015.3	+0.0045	+0.1721	+34.7566	+0.0053	+0.0161
+49895.3	+0.0036	+0.1832	+45.6558	+0.0041	+0.0111
+59819.9	+0.0030	+0.2054	+72.3656	+0.0033	+0.0222
+49895.1	+0.0036	+0.2054	+72.3656	+0.0033	+0.0000
+40149.1	+0.0045	+0.2054	+72.3656	+0.0041	+0.0000
+30060.5	+0.0060	+0.2054	+72.3656	+0.0053	+0.0000
+25083.2	+0.0072	+0.2050	+72.1286	+0.0066	-0.0004
+20076.1	+0.0090	+0.2025	+70.8842	+0.0081	-0.0025
+15054.1	+0.0120	+0.1987	+69.4354	+0.0105	-0.0038
+12565.5	+0.0144	+0.1949	+68.2876	+0.0132	-0.0038
+10047.1	+0.0180	+0.1906	+67.2404	+0.0162	-0.0042
+7528.7	+0.0240	+0.1830	+65.7932	+0.0210	-0.0076
+5010.3	+0.0361	+0.1712	+64.2164	+0.0301	-0.0119
+3513.1	+0.0515	+0.1523	+62.4951	+0.0438	-0.0188
+2511.2	+0.0720	+0.1368	+61.4882	+0.0618	-0.0155
+1005.1	+0.1799	+0.0924	+60.0783	+0.1260	-0.0444
+751.2	+0.2408	+0.0786	+59.8163	+0.2104	-0.0138
+501.3	+0.3608	+0.0615	+59.5890	+0.3008	-0.0171
+399.7	+0.4524	+0.0548	+59.5232	+0.4066	-0.0067
+301.1	+0.6006	+0.0490	+59.4787	+0.5265	-0.0059
+249.4	+0.7253	+0.0469	+59.4659	+0.6629	-0.0021
+197.6	+0.9152	+0.0460	+59.4616	+0.8203	-0.0009
+150.5	+1.2017	+0.0451	+59.4583	+1.0585	-0.0009
+100.8	+1.7935	+0.0446	+59.4570	+1.4976	-0.0005
+73.7	+2.4553	+0.0446	+59.4570	+2.1244	-0.0000
+60.1	+3.0085	+0.0438	+59.4557	+2.7319	-0.0008
+48.0	+3.7657	+0.0438	+59.4557	+3.3871	-0.0000
+22.3	+8.1042	+0.0433	+59.4554	+5.9350	-0.0004

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

100% = +0.2054



ONTARIO RESEARCH FPL
4000 (50) 28 DAYS
PNTR NUMBER +40

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER
100% = +72.3656



ONTARIO RESEARCH FPL
4000 (50) 28 DAYS
PNTR NUMBER +40

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

INCREMENTAL VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.296818E-001

0%	20%	40%	60%	80%	100%
I.....I.....I.....I.....I.....I.....I					
+300--*					
+235--*					
+184--*					
+144--**					
+113--***					
+88.1--****					
+69.0--***					
+54.0--**					
+42.3--*					
+33.1--*					
+25.9--*					
+20.3--*					
+15.9--*					
+12.4--*					
+9.72--*					
+7.61--*					
+5.96--*					
+4.66--*					
+3.65--*					
+2.86--*					
+2.24--*					
+1.75--*					
+1.37--*					
+1.07--*					
+0.839--*					
+0.657--*					
+0.514--*					
+0.402--*					
+0.315--*					
+0.247--*					
+0.193--*					
+0.151--**					
+0.118--*****					
+0.0926--*****					
+0.0725--*****					
+0.0567--*****					
+0.0444--*****					
+0.0347--*****					
+0.0272--*****					
+0.0213--*****					
+0.0167--*					
+0.0130--*					
+0.0102--*****					
+0.00799--*****					
+0.00626--*****					
+0.00490--*****					
+0.00383--*****					
+0.00300--*					

ONTARIO RESEARCH FPL
4000 (50) 28 DAYS
PNTR NUMBER +40

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

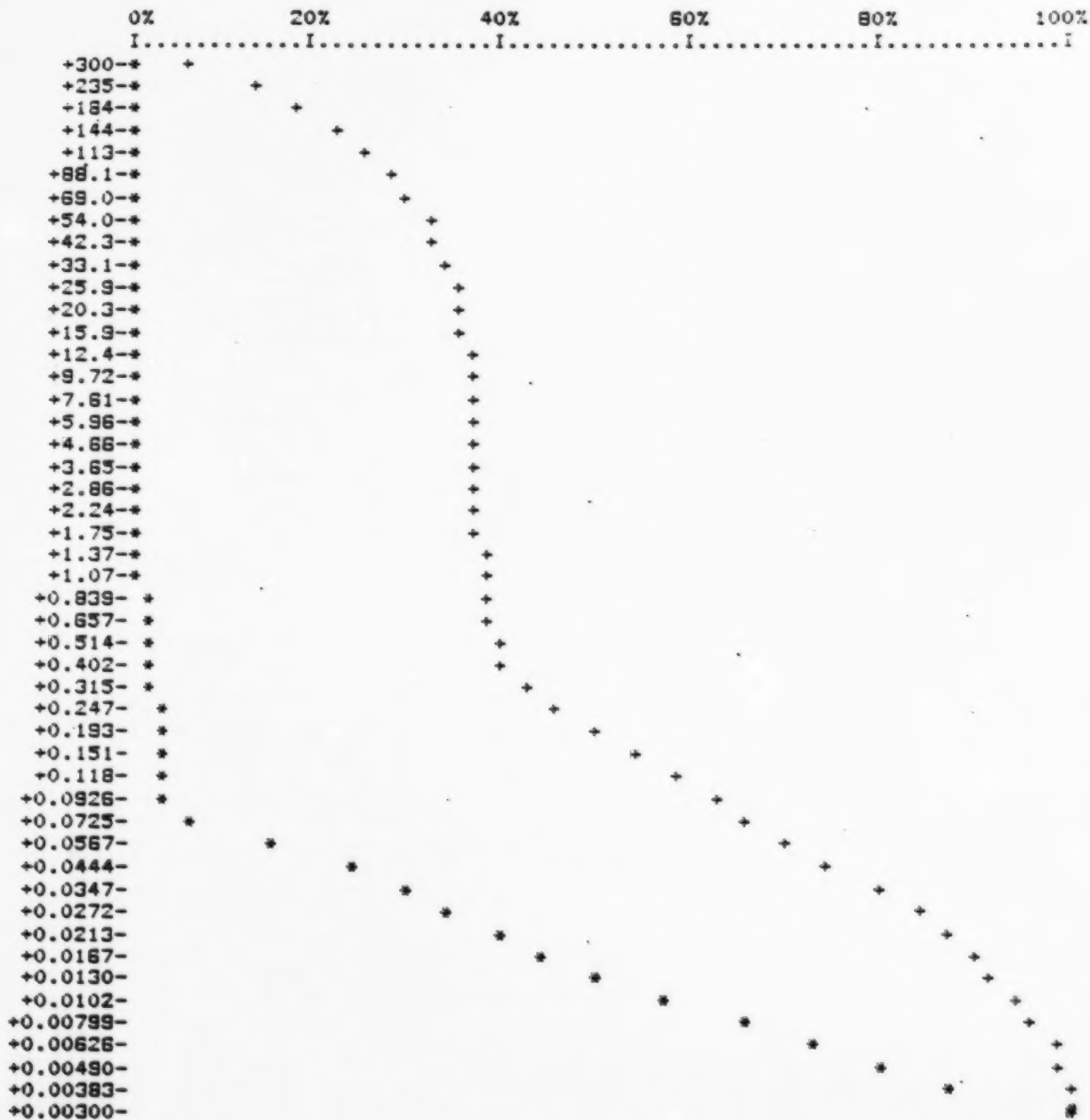
INCREMENTAL SURFACE AREA (M2/G) VS. DIAMETER
100% = +0.111904E+002

0%	20%	40%	60%	80%	100%
I.....	I.....	I.....	I.....	I.....	I.....
+300--					
+235--					
+184--					
+144--					
+113--					
+88.1--					
+69.0--					
+54.0--					
+42.3--					
+33.1--					
+25.9--					
+20.3--					
+15.9--					
+12.4--					
+9.72--					
+7.61--					
+5.96--					
+4.66--					
+3.65--					
+2.86--					
+2.24--					
+1.75--					
+1.37--					
+1.07--					
+0.839--					
+0.657--					
+0.514--					
+0.402--					
+0.315--					
+0.247--					
+0.193--					
+0.151--					
+0.118--					
+0.0926--					
+0.0725-----					
+0.0567-----					
+0.0444-----					
+0.0347-----					
+0.0272-----					
+0.0213-----					
+0.0167--					
+0.0130--					
+0.0102-----					
+0.00799-----					
+0.00626-----					
+0.00490-----					
+0.00383-----					
+0.00300--					

ONTARIO RESEARCH FPL
6000 (50) 28 DAYS
PNTR NUMBER +45

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

CUMULATIVE PORE VOLUME (CC/G) VS. PORE DIAMETER
100% = +0.2674

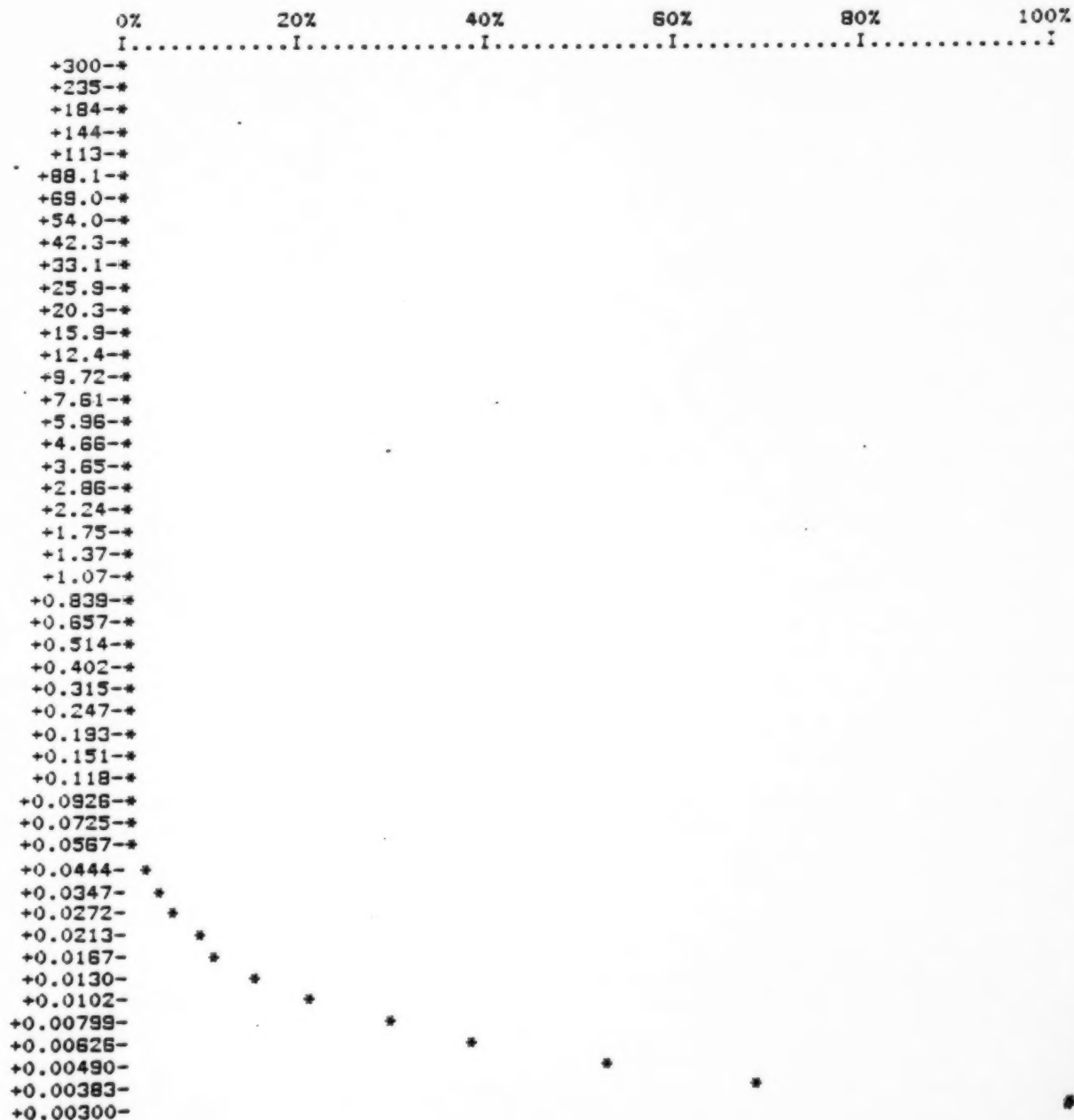


ONTARIO RESEARCH FPL
6000 (50) 28 DAYS
PNTR NUMBER +45

LP 8:19:8 8/13/85
HP 10:28:36 8/13/85

CUMULATIVE SURFACE AREA (M2/G) VS. PORE DIAMETER

100% = +114.9550



LP 8:19:8 8/13/85
HP 10:28:36 8/13/85 35

[illegible]